

summary judgment of non-infringement was properly granted. See *Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus., Inc.*, 145 F.3d 1303, 1311, 46 USPQ2d 1752, 1758 (Fed.Cir.1998) (concluding that "no reasonable jury" could conclude that the accused device infringed under the doctrine of equivalents); *Laitram Corp. v. Morehouse Indus., Inc.*, 143 F.3d 1456 (Fed.Cir.1998) (same); *Dawn Equip.*, 140 F.3d at 1017, 46 USPQ2d at 1114-15.

b. TP-900

1. Literal Infringement. DBI makes two arguments in favor of finding infringement by the TP-900. The first is that the TP-900 infringes because it includes four TP-600s, which infringe. Because we affirmed the district court's judgment of non-infringement of the TP-600, this argument must fail.

[19] DBI also argues that the TP-900 infringes claim 16 because each TP-600 generates an array of "slice data" and the TP-900 system "generates a composite array of data characteristic of the rolled fingerprint image as a mathematical function of overlapping slice data." The district court interpreted claim 16 to require that the "arrays of slice data" must be "data characteristic of the portion of the finger in contact with the surface of the platen at a particular time." Because each of the partial images was itself a composite image, the district court found that the partial images did not contain "data characteristic of the portion of the finger in contact with the surface of the platen at a particular time," and thus did not satisfy this limitation. Again, DBI does not challenge the district court's claim construction on this point. It is undisputed that the resulting partial images are themselves composite images made up by merging image data from a plurality of successive images. As such, we cannot say that the district court erred in granting summary judgment, even when the evidence is viewed most favorably to DBI.

2. Equivalent Infringement. DBI does not argue that the TP-900 infringes under the doctrine of equivalents even if there is no literal infringement, other than its argument that the TP-900 infringes because it includes four TP-600s. Thus, infringement of the TP-900 under the doctrine of equivalents stands or (in this case) falls with the TP-600.

Because we conclude that the TP-600 does not infringe, the TP-900 also does not infringe under the doctrine of equivalents.

C. CONCLUSION

For the reasons stated herein, the summary judgments of non-infringement are *AFIRMED*.

COSTS

Each party to bear its own costs.



In re Denis ROUFFET, Yannick Tanguy
and Frederic Berthault.

No. 97-1492.

United States Court of Appeals,
Federal Circuit.

July 15, 1998.

Applicants sought patent for invention claiming satellite technology to reduce number of necessary "handovers" between beams transmitted by single satellite. The Board of Patent Appeals and Interferences rejected application as obvious, and applicants appealed. The Court of Appeals, Rader, Circuit Judge, held that neither combination of two prior art patents and conference report nor combination of two other prior art patents rendered invention obvious, absent motivation to combine those references.

Reversed.

I. Patents $\text{C}\Rightarrow$ 112.3(2)

To reject claims in patent application as obvious, an examiner must show un rebutted prima facie case of obviousness; in absence of proper prima facie case, applicant who complies with the other statutory requirements is entitled to a patent. 35 U.S.C.A. § 103.

2. Patents \Rightarrow 113(6)

On appeal to Board of Patent Appeals and Interferences, patent applicant can overcome a rejection on grounds of obviousness by showing insufficient evidence of prima facie obviousness or by rebutting prima facie case with evidence of secondary indicia of nonobviousness. 35 U.S.C.A. § 103.

3. Patents \Rightarrow 113(6)

While Court of Appeals reviews determination of obviousness by Board of Patent Appeals and Interferences in light of entire record, patent applicant may specifically challenge an obviousness rejection by showing that Board reached an incorrect conclusion of obviousness or that Board based its obviousness determination on incorrect factual predicates.

4. Patents \Rightarrow 113(6)

Court of Appeals reviews ultimate determination of obviousness by Board of Patent Appeals and Interferences as a question of law.

5. Patents \Rightarrow 16(2), 16.5(1)

The factual predicates underlying an obviousness determination include the scope and content of the prior art, the differences between the prior art and the claimed invention, and the level of ordinary skill in the art. 35 U.S.C.A. § 103.

6. Patents \Rightarrow 113(6)

Court of Appeals reviews factual findings of Board of Patent Appeals and Interferences for clear error, and finding is clearly erroneous when, although there is evidence to support it, the reviewing court on the entire evidence is left with the definite and firm conviction that a mistake has been committed.

7. Patents \Rightarrow 36.1(2, 3, 4), 36.2(1)

Objective evidence of invention's nonobviousness includes copying, long felt but unsolved need, failure of others, commercial success, unexpected results created by the claimed invention, unexpected properties of the claimed invention, licenses showing industry respect for the invention, and skepticism of skilled artisans before the invention. 35 U.S.C.A. § 103.

8. Patents \Rightarrow 97

Board of Patent Appeals and Interferences must consider all of patent applicant's evidence in determining whether claimed invention is obvious. 35 U.S.C.A. § 103.

9. Patents \Rightarrow 314(5)

Whether the evidence presented suffices to rebut the prima facie case of obviousness is part of the ultimate conclusion of obviousness and is therefore a question of law. 35 U.S.C.A. § 103.

10. Patents \Rightarrow 16.5(1)

When rejection of patent application for obviousness depends on a combination of prior art references, there must be some teaching, suggestion, or motivation to combine the references. 35 U.S.C.A. § 103.

11. Patents \Rightarrow 26(1)

When determining the patentability of a claimed invention which combines two known elements, the question in determining issue of obviousness is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination. 35 U.S.C.A. § 103.

12. Patents \Rightarrow 26(1)

Combination of two prior art patents and conference report did not render obvious invention claiming satellite technology to reduce number of necessary "handovers" between beams transmitted by single satellite, even if combination of references contained all elements claimed in patent application, absent any evidence of motivation to combine such references other than high level of skill in the relevant art. 35 U.S.C.A. § 103.

13. Patents \Rightarrow 16(3)

Obviousness is determined from vantage point of a hypothetical person having ordinary skill in the art to which the patent pertains, which is construct akin to "reasonable person" used as reference in negligence determinations and presumes that all prior art references in the field of the invention are available to hypothetical skilled artisan. 35 U.S.C.A. § 103(a).

14. Patents \Rightarrow 26(1)

Combination of prior art patents relating to cellular communications systems did not

render obvious invention claiming satellite technology to reduce number of necessary "handovers" between beams transmitted by single satellite, absent identification of specific principle providing motivation to combine those prior art references. 35 U.S.C.A. § 103.

Richard C. Turner and Grant K. Rowan, Sughrue, Mion, Zinn, Macpeak & Seas, PLLC, Washington, DC, argued for appellants.

David J. Ball, Jr., Associate Solicitor, Office of the Solicitor, Patent and Trademark Office, Arlington, Virginia, argued for appellee. With him on the brief were Nancy J. Linck, Solicitor, Albin F. Drost, Deputy Solicitor, and Craig R. Kaufman, Associate Solicitor. Of counsel was Scott A. Chambers, Associate Solicitor, Office of the Solicitor.

Before PLAGER, Circuit Judge,
ARCHER, Senior Circuit Judge, and
RADER, Circuit Judge.

RADER, Circuit Judge.

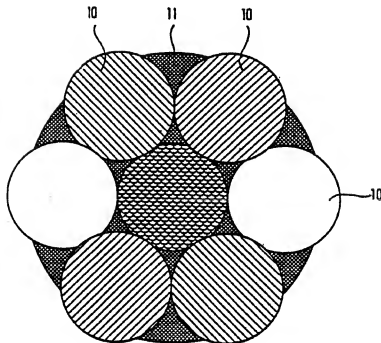
Denis Rouffet, Yannick Tanguy, and Frédéric Bethault (collectively, Rouffet) submitted

application 07/888,791 (the application) on May 27, 1992. The Board of Patent Appeals and Interferences (the Board) affirmed final rejection of the application as obvious under 35 U.S.C. § 103(a). See *Ex parte Rouffet*, No. 96-1553 (Bd. Pat.App. & Int. Apr. 16, 1997). Because the Board reversibly erred in identifying a motivation to combine the references, this court reverses.

I.

Satellites in a geosynchronous or geostationary orbit remain over the same point on the Earth's surface. Their constant position above the Earth's surface facilitates communications. These satellites project a number of beams to the Earth. Each beam transmits to its area of coverage, or footprint, on the Earth's surface. In order to provide complete coverage, adjacent footprints overlap slightly and therefore must use different frequencies to avoid interference. However, two or more non-overlapping footprints can use the same set of frequencies in order to use efficiently the limited radio spectrum. Figure 1 from the application shows the coverage of a portion of the Earth's surface provided by multiple cone shaped beams:

FIG. 1



Frequency reuse techniques, however, have a limited ability to compensate for congestion in geostationary orbits. To alleviate the orbit congestion problem, new telecommunications systems use a network of satellites in low Earth orbit. When viewed from a fixed point on the Earth's surface, such satellites do not remain stationary but move overhead. A satellite's motion as it transmits a plurality of cone-shaped beams creates a new problem. The satellite's movement causes a receiver on the Earth's surface to move from the footprint of one beam into a second beam transmitted by the same satellite. Eventually, the satellite's motion causes the receiver to move from the footprint of a beam transmitted by one satellite into the footprint of a beam transmitted by a second satellite. Each switch from one footprint to another creates a "handover" event analogous to that which occurs when a traditional cellular phone travels from one cell to another. Handovers are undesirable because they

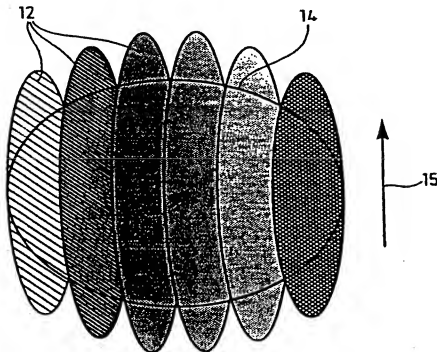
can cause interruptions in signal transmission and reception.

Rouffet's application discloses technology to reduce the number of handovers between beams transmitted by the same satellite. In particular, Rouffet eliminates handovers caused solely by the satellite's motion. To accomplish this goal, Rouffet changes the shape of the beam transmitted by the satellite's antenna. Rouffet's satellites transmit fan-shaped beams. A fan beam has an elliptical footprint. Rouffet aligns the long axis of his beams parallel to the direction of the satellite's motion across the Earth's surface. By elongating the beam's footprint in the direction of satellite travel, Rouffet's invention ensures that a fixed point on the Earth's surface likely will remain within a single footprint until it is necessary to switch to another satellite. Because Rouffet's invention does not address handovers caused by the motion of the receiver across the Earth's

surface. his arrangement reduces, but does not eliminate, handovers. Figure 3 from the application shows the footprints 12 from six

beams aligned in the direction of satellite motion 15:

FIG. 3



The application contains ten claims that stand or fall as a group. Claim 1 is representative:

A low orbit satellite communications system for mobile terminals, wherein the communications antenna system of each satellite provides isoflux coverage made up of a plurality of fan beams that are elongate in the travel direction of the satellite.

The examiner initially rejected Rouffet's claims as unpatentable over U.S. Pat. No. 5,199,672 (King) in view of U.S. Pat. No. 4,872,015 (Rosen) and a conference report entitled "A Novel Non-Geostationary Satellite Communications System," *Conference Record*, International Conference on Com-

munications, 1981 (Ruddy). On appeal to the Board, the examiner added an alternative ground for rejection, holding that the claims were obvious over U.S. Pat. No. 5,394,561 (Freeburg) in view of U.S. Pat. No. 5,170,485 (Levine).

On April 16, 1997, the Board issued its decision. Because Rouffet had specified that the claims would stand or fall as a group based on the patentability of claim 1, the Board limited its opinion to that claim. The Board unanimously determined that the examiner had properly rejected claim 1 as obvious over King in view of Rosen and Ruddy. The Board, on a split vote, also affirmed the rejection over Freeburg in view of Levine.

II

[1, 2] To reject claims in an application under section 103, an examiner must show an un rebutted *prima facie* case of obviousness. See *In re Deuel*, 51 F.3d 1552, 1557, 34 U.S.P.Q.2d 1210, 1214 (Fed.Cir.1995). In the absence of a proper *prima facie* case of obviousness, an applicant who complies with the other statutory requirements is entitled to a patent. See *In re Otiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir.1992). On appeal to the Board, an applicant can overcome a rejection by showing insufficient evidence of *prima facie* obviousness or by rebutting the *prima facie* case with evidence of secondary indicia of nonobviousness. See *id.*

[3-6] While this court reviews the Board's determination in light of the entire record, an applicant may specifically challenge an obviousness rejection by showing that the Board reached an incorrect conclusion of obviousness or that the Board based its obviousness determination on incorrect factual predicates. This court reviews the ultimate determination of obviousness as a question of law. See *In re Lueders*, 111 F.3d 1569, 1571, 42 U.S.P.Q.2d 1481, 1482 (Fed. Cir.1997). The factual predicates underlying an obviousness determination include the scope and content of the prior art, the differences between the prior art and the claimed invention, and the level of ordinary skill in the art. See *Monarch Knitting Mach. Corp. v. Sulzer Morat GmbH*, 139 F.3d 877, 881, 45 U.S.P.Q.2d 1977, 1981 (Fed.Cir.1998). This court reviews the Board's factual findings for clear error. See *In re Zurko*, 142 F.3d, 1447, 1449, 46 U.S.P.Q.2d 1691, 1693 (Fed.Cir.1998) (in banc); *Lueders*, 111 F.3d at 1571-72. "A finding is clearly erroneous when, although there is evidence to support it, the reviewing court on the entire evidence is left with the definite and firm conviction that a mistake has been committed." *In re Graves*, 69 F.3d 1147, 1151, 36 U.S.P.Q.2d 1697, 1700 (Fed.Cir.1995) (quoting *United States v. United States Gypsum Co.*, 333 U.S. 364, 395, 68 S.Ct. 525, 92 L.Ed. 746 (1948)).

[7-9] The secondary considerations are also essential components of the obviousness determination. See *In re Emert*, 124 F.3d 1458, 1462, 44 U.S.P.Q.2d 1149, 1153 (Fed.

Cir.1997) ("Without Emert providing rebuttal evidence, this *prima facie* case of obviousness must stand."). This objective evidence of nonobviousness includes copying, long felt but unsolved need, failure of others, see *Graham v. John Deere Co.*, 383 U.S. 1, 17-18, 86 S.Ct. 684, 15 L.Ed.2d 545 (1966), commercial success, see *In re Huang*, 100 F.3d 135, 139-40, 40 U.S.P.Q.2d 1685, 1689-90 (Fed.Cir. 1996), unexpected results created by the claimed invention, unexpected properties of the claimed invention, see *In re Mayne*, 104 F.3d 1339, 1342, 41 U.S.P.Q.2d 1451, 1454 (Fed.Cir.1997); *In re Woodruff*, 919 F.2d 1575, 1578, 16 U.S.P.Q.2d 1934, 1936-37 (Fed. Cir.1990), licenses showing industry respect for the invention, see *Artie Lares, Inc. v. Gene Larew Tackla, Inc.*, 119 F.3d 953, 957, 43 U.S.P.Q.2d 1294, 1297 (Fed.Cir.1997); *Pentac, Inc. v. Graphic Controls Corp.*, 776 F.2d 309, 316, 227 U.S.P.Q. 766, 771 (Fed.Cir. 1985), and skepticism of skilled artisans before the invention, see *In re Dow Chem. Co.*, 837 F.2d 469, 473, 5 U.S.P.Q.2d 1529, 1532 (Fed.Cir.1988). The Board must consider all of the applicant's evidence. See *Otiker*, 977 F.2d at 1445 ("An observation by the Board that the examiner made a *prima facie* case is not improper, as long as the ultimate determination of patentability is made on the entire record."); *In re Piasecki*, 745 F.2d 1468, 1472, 223 U.S.P.Q. 785, 788 (Fed.Cir.1984). The court reviews factual conclusions drawn from this evidence for clear error. Whether the evidence presented suffices to rebut the *prima facie* case is part of the ultimate conclusion of obviousness and is therefore a question of law.

[10, 11] When a rejection depends on a combination of prior art references, there must be some teaching, suggestion, or motivation to combine the references. See *In re Geiger*, 815 F.2d 686, 688, 2 U.S.P.Q.2d 1276, 1278 (Fed.Cir.1987). Although the suggestion to combine references may flow from the nature of the problem, see *Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc.*, 75 F.3d 1568, 1573, 37 U.S.P.Q.2d 1626, 1630 (Fed. Cir.1996), the suggestion more often comes from the teachings of the pertinent references, see *In re Sernaker*, 702 F.2d 989, 994, 217 U.S.P.Q. 1, 5 (Fed.Cir.1983), or from the ordinary knowledge of those skilled in the art that certain references are of special impor-

tance in a particular field, see *Pro-Mold*, 75 F.3d at 1573 (citing *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 776 F.2d 281, 297 n. 24, 227 U.S.P.Q. 657, 667 n. 24 (Fed.Cir.1985)). Therefore, "[w]hen determining the patentability of a claimed invention which combines two known elements, 'the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination.'" See *In re Beatie*, 974 F.2d 1309, 1311-12, 24 U.S.P.Q.2d 1040, 1042 (Fed.Cir.1992) (quoting *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1462, 221 U.S.P.Q. 481, 488 (Fed.Cir.1984)).

III

The parties agree that the five references asserted by the examiner are in the same field of endeavor as the invention. The parties also agree that the pertinent level of skill in the art—design of satellite communications systems—is high. On appeal, Rouffet asserts that the examiner and the Board erred by improperly combining references to render the claimed invention obvious.

The Combination of King, Rosen, and Ruddy

[12] The Board first affirmed the rejection of Rouffet's claims over a combination of King, Rosen, and Ruddy. King discloses a system for launching a plurality of satellites into low Earth orbits from a single launch vehicle. Rosen teaches a geostationary satellite that uses a plurality of fan beams with their long axes oriented in an east-west direction to communicate with mobile and fixed terminals on the Earth.

The final, and most important, reference in this combination is Ruddy. Ruddy describes a television broadcast system that uses a series of satellites to retransmit signals sent from a ground station over a wide area. Rather than using a geostationary orbit, Ruddy teaches the use of a series of satellites in Molniya orbits. A satellite in a Molniya orbit always follows the same path through the sky when viewed from a fixed point on the ground. Viewed from the Earth, the orbital path includes a narrow, elliptical apogee loop. In order to transmit to these moving satellites from a ground station, Ruddy uses a fan beam with a long axis aligned with the long axis of the orbit's apogee loop. This alignment places the entire apogee loop

within the footprint of the beam and eliminates the need for the ground station's antenna to track the satellite's motion around the apogee loop. Ruddy further teaches orbit parameters and spacing of multiple satellites to ensure that a satellite is always in the loop to receive and rebroadcast signals from the Earth station.

King and Rosen together teach the use of a network of satellites in low Earth orbit. Thus, Ruddy becomes the piece of the prior art mosaic that shows, in the reading of the Board, the use of "a plurality of fan beams that are elongate in the travel direction of the satellite." Ruddy, however, is different from the claimed invention in several respects. Specifically, the application claims the projection of multiple elliptical fan-shaped footprints from the satellite to the ground. See Claim 1, *supra*, see also Application at 6, lines 9-11 ("In addition, in this system, the geometrical shape of the beams 12 is changed: instead of being circular they are now elongate ellipses."). The application's written description further teaches that the invention's fan-shaped satellite beams will minimize handovers. See *id.* at lines 11-16 ("This considerably increases call durations between handovers.").

In contrast, Ruddy teaches that a ground station may use a single fan-shaped beam to transmit to a satellite in a unique Molniya orbit. The ground station transmits a beam into which a series of satellites in Molniya orbits will successively enter. At least two differences are evident: the application teaches projection of multiple beams from a satellite to the Earth, while Ruddy teaches projection of a single beam from the Earth to satellites. Moreover to the extent Ruddy contains a teaching about handovers, its teachings focus on use of the unique Molniya orbit to ensure that a satellite always falls within the beam transmitted by the ground station.

These differences suggest some difficulty in showing a *prima facie* case of obviousness. The Board, however, specifically found that artisans of ordinary skill in this field of art would know to shift the frame of reference from a ground station following a satellite to a satellite transmitting to the ground. According proper deference to the Board's find-

ing of a lofty skill level for ordinary artisans in this field, this court discerns no clear error in the Board's conclusion that these differences would not preclude a finding of obviousness. While Ruddy does not expressly teach alignment of the fan beam with the apparent direction of the satellite's motion, this court perceives no clear error in the Board's determination that Ruddy would suggest such an alignment to one of skill in this art. Therefore, the Board did not err in finding that the combination of King, Rosen, and Ruddy contains all of the elements claimed in Rouffet's application.

However, the Board reversibly erred in determining that one of skill in the art would have been motivated to combine these references in a manner that rendered the claimed invention obvious. Indeed, the Board did not identify any motivation to choose these references for combination. Ruddy does not specifically address handover minimization. To the extent that Ruddy at all addresses handovers due to satellite motion, it addresses this subject through the selection of orbital parameters. Ruddy does not teach the choice of a particular shape and alignment of the beam projected by the satellite. Thus Ruddy addresses the handover problem with an orbit selection, not a beam shape. The Board provides no reasons that one of ordinary skill in this art, seeking to minimize handovers due to satellite motion, would combine Ruddy with Rosen and King in a manner that would render the claimed invention obvious.

[13] Obviousness is determined from the vantage point of a hypothetical person having ordinary skill in the art to which the patent pertains. See 35 U.S.C. § 103(a). This legal construct is akin to the "reasonable person" used as a reference in negligence determinations. The legal construct also presumes that all prior art references in the field of the invention are available to this hypothetical skilled artisan. See *In re Carlson*, 983 F.2d 1032, 1038, 25 U.S.P.Q.2d 1207, 1211 (Fed. Cir.1993).

As this court has stated, "virtually all [inventions] are combinations of old elements." *Environmental Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 698, 218 U.S.P.Q. 865, 870 (Fed.Cir.1983); see also *Richdel, Inc. v. Sunspool Corp.*, 714 F.2d 1573, 1579-80, 219 U.S.P.Q. 8, 12 (Fed.Cir.1983) ("Most, if not all, inventions are combinations and mostly

of old elements."). Therefore an examiner may often find every element of a claimed invention in the prior art. If identification of each claimed element in the prior art were sufficient to negate patentability, very few patents would ever issue. Furthermore, rejecting patents solely by finding prior art corollaries for the claimed elements would permit an examiner to use the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. Such an approach would be "an illogical and inappropriate process by which to determine patentability." *Sensonics, Inc. v. Aerosonic Corp.*, 81 F.3d 1566, 1570, 38 U.S.P.Q.2d 1551, 1554 (Fed.Cir.1996).

To prevent the use of hindsight based on the invention to defeat patentability of the invention, this court requires the examiner to show a motivation to combine the references that create the case of obviousness. In other words, the examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed.

This court has identified three possible sources for a motivation to combine references: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art. In this case, the Board relied upon none of these. Rather, just as it relied on the high level of skill in the art to overcome the differences between the claimed invention and the selected elements in the references, it relied upon the high level of skill in the art to provide the necessary motivation. The Board did not, however, explain what specific understanding or technological principle within the knowledge of one of ordinary skill in the art would have suggested the combination. Instead, the Board merely invoked the high level of skill in the field of art. If such a rote invocation could suffice to supply a motivation to combine, the more sophisticated scientific fields would rarely, if ever, experience a patentable technical advance. Instead, in complex scientific fields, the Board could routinely identify the prior art elements in an application, invoke the lofty level of skill, and rest its case for rejection. To counter this potential weakness in the obvi-

ousness construct, the suggestion to combine requirement stands as a critical safeguard against hindsight analysis and rote application of the legal test for obviousness.

Because the Board did not explain the specific understanding or principle within the knowledge of a skilled artisan that would motivate one with no knowledge of Rouffet's invention to make the combination, this court infers that the examiner selected these references with the assistance of hindsight. This court forbids the use of hindsight in the selection of references that comprise the case of obviousness. See *In re Gorman*, 933 F.2d 982, 986, 18 U.S.P.Q.2d 1885, 1888 (Fed.Cir. 1991). Lacking a motivation to combine references, the Board did not show a proper *prima facie* case of obviousness. This court reverses the rejection over the combination of King, Rosen, and Ruddy.

The Combination of Freeburg and Levine

[14] Freeburg teaches a cellular radio-telephone system based on a constellation of low Earth orbit satellites that use conical beams to transmit from the satellite to both fixed and mobile Earth stations. Levine teaches an Earth-based cellular radio system that uses fan beams broadcast from antenna towers. Levine's elliptical footprints are aligned with the road grid. To increase the capacity of traditional ground-based systems through frequency reuse techniques, Levine teaches the use of antennas that broadcast signals with smaller footprints than the prior art system. Thus, Levine actually increases the number of overlap regions between cells and, hence, the number of potential handovers. Figure 1 of the Levine patent illustrates its alignment of beam footprints:

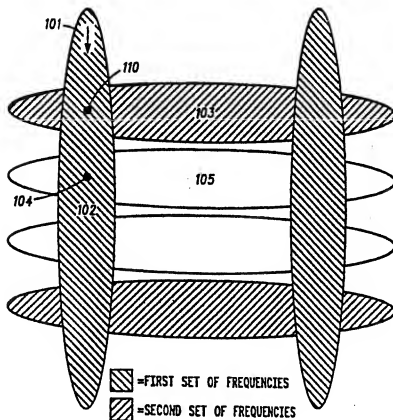


FIG. 1

As a mobile unit (e.g., a driver using a car phone) moves through a succession of overlapping zones, Levine uses selection algorithms to determine which of the cells is aligned with the travel direction of the mobile unit. These algorithms then select this cell for use while continually monitoring intersecting cells in the event that the mobile unit changes direction.

Once again, this court notes significant differences between the teachings of the application and the Levine-Freeburg combination. The critical Levine reference again involves a beam from an Earth station without any reference to the "travel direction of [a] satellite." Moreover, Levine actually multiplies the number of potential handovers and then uses software to sort out the necessary handovers from the unnecessary. However, the Board explains the reasons that one possessing the lofty skills characteristic of this field would know to account for the differences between the claimed invention and the prior art combination. This court discerns no clear error in that reliance on the considerable skills in this field.

This court does, however, discern reversible error in the Board's identification of a motivation to combine Levine and Freeburg. In determining that one of skill in the art would have had motivation to combine Levine and Freeburg, the Board noted that "[t]he level of skill in the art is very high." As noted before, this observation alone cannot supply the required suggestion to combine these references. The Board posits that the high level of skill in the art overcomes the absence of any actual suggestion that one could select part of the teachings of Levine for combination with the satellite system disclosed by Freeburg.

As noted above, the suggestion to combine requirement is a safeguard against the use of hindsight combinations to negate patentability. While the skill level is a component of the inquiry for a suggestion to combine, a lofty level of skill alone does not suffice to supply a motivation to combine. Otherwise a high level of ordinary skill in an art field would almost always preclude patentable inventions. As this court has often noted, invention itself is the process of combining prior art in a nonobvious manner. See, e.g., *Richdel*, 714 F.2d at 1579; *Environmental*

Designs, 713 F.2d at 698. Therefore, even when the level of skill in the art is high, the Board must identify specifically the principle, known to one of ordinary skill, that suggests the claimed combination. Cf. *Gochlov v. Davidson*, 116 F.3d 1454, 43 U.S.P.Q.2d 1030 (Fed.Cir.1997) (explaining that the Board's opinion must describe the basis for its decision). In other words, the Board must explain the reasons one of ordinary skill in the art would have been motivated to select the references and to combine them to render the claimed invention obvious.

The Board's naked invocation of skill in the art to supply a suggestion to combine the references cited in this case is therefore clearly erroneous. Absent any proper motivation to combine part of Levine's teachings with Freeburg's satellite system, the rejection of Rouffet's claim over these references was improper and is reversed.

IV

The Board reversibly erred in determining that there was a motivation to combine either the teachings of King, Rosen, and Ruddy or of Freeburg and Levine in a manner that would render the claimed invention obvious. Because this predicate was missing in each case, the Board did not properly show that these references render the claimed invention obvious. Therefore this court reverses the Board's decision upholding the rejection of Rouffet's claims. In light of this disposition, Rouffet's pending motion to remand the case to the Board for further consideration is denied as moot.

COSTS

Each party shall bear its own costs.

REVERSED.



payer also has elicited testimony indicating that Jane Simon, Inc. was thinly capitalized. The taxpayer argues that it is highly unlikely that the bank would have advanced funds directly to Jane Simon, Inc.—a fledgling enterprise operated by a novice in a highly competitive field. This argument is further supported by the fact that the bank previously had approved a line of credit consistent with the credit enjoyed by Jane Simon, Inc. to Jane Selfe, nee Simon, based upon her pledge of Avondale stock. The government, however, notes that it was at the bank's insistence that the line of credit originally approved for the taxpayer was converted to loans to the corporation guaranteed by the taxpayer.

Accordingly, we conclude that there are material facts still in issue and therefore summary judgment was inappropriate. We remand for a determination of whether or not the bank primarily looked to Jane Selfe for repayment and for the court to apply the factors set out in *In re Lane* and I.R.C. section 385 to determine if the taxpayer's guarantee amounted to either an equity investment in or shareholder loan to Jane Simon, Inc. In short, we remand for the district court to apply *Plantation Patterns* and determine if the bank loan to Jane Simon, Inc. was in reality a loan to the taxpayer.

REVERSED and REMANDED.



**TITANIUM METALS CORPORATION
OF AMERICA, Appellee,**

v.

**Donald W. BANNER, Commissioner of
Patents and Trademarks, Appellant.
Appeal No. 85-1452.**

United States Court of Appeals,
Federal Circuit.

Nov. 7, 1985.

Civil action was brought against Commissioner of Patents and Trademarks au-

thorizing Commissioner to issue patent for titanium alloy. The United States District Court for the District of Columbia, John Garrett Penn, J., authorized Commissioner to issue patent, and Commissioner appealed. The Court of Appeals for the Federal Circuit, Rich, Circuit Judge, held that patent was improperly issued.

Reversed.

1. Patents \Leftarrow 68

Anticipation under 35 U.S.C.A. § 102 can be found only when reference discloses exactly what is claimed, and when there are differences between reference disclosure and claim, rejection must be based on statute [35 U.S.C.A. § 103] which takes differences into account.

2. Patents \Leftarrow 324.55(2)

Patent claim interpretation is a question of law free from clearly erroneous standard of review.

3. Patents \Leftarrow 70

Patent was improperly issued for claims 1 and 2 of patent application for titanium alloy since claims were anticipated under 35 U.S.C.A. § 102 by Russian article which admittedly disclosed alloy on which those claims read.

4. Patents \Leftarrow 16.34

Specific alloy of claim 3 of patent application for titanium alloy was obvious from known alloys and therefore invalid for obviousness. 35 U.S.C.A. § 103.

Fred E. McKelvey, Deputy Sol., U.S. Patent and Trademark Office of Arlington, Va., argued for appellant. With him on the brief were Joseph F. Nakamura, Sol. and Henry W. Tarring, II, Associate Sol., Washington, DC.

David C. Bruening, Webb, Burden, Robinson & Webb, P.A., of Pittsburgh, Pa., argued for appellee. With him on the brief was Richard L. Byrne.

Before RICH, Circuit Judge, NICHOLS, Senior Circuit Judge, and NEWMAN, Circuit Judge.

RICH, Circuit Judge.

This appeal is from an Order of the United States District Court for the District of Columbia in a civil action brought pursuant to 35 U.S.C. § 145 against Donald W. Banner as Commissioner of Patents and Trademarks¹ authorizing the Commissioner to issue to appellee a patent containing claims 1, 2, and 3 of patent application serial No. 598,985 for "TITANIUM ALLOY." The Commissioner has appealed. We reverse.

Background

The inventors, Loren C. Covington and Howard R. Palmer, employees of appellee to whom they have assigned their invention and the application thereon, filed an application on March 29, 1974, serial No. 455,964, to patent an alloy they developed. The application involved on this appeal is a continuation-in-part thereof, filed July 25, 1975, containing the three claims on appeal. The alloy is made primarily of titanium (Ti) and contains small amounts of nickel (Ni) and molybdenum (Mo) as alloying ingredients to give the alloy certain desirable properties, particularly corrosion resistance in hot brine solutions, while retaining workability so that articles such as tubing can be fabricated from it by rolling, welding and other techniques. The inventors apparently also found that iron content should be limited, iron being an undesired impurity rather than an alloying ingredient. They determined the permissible ranges of the components, above and below which the desired properties were not obtained. A precise definition of the invention sought to be patented is found in the claims, set forth below, claim 3 representing the preferred composition, it being understood, however, that no iron at all would be even more preferred.

1. After suit was brought and before entry of said Order, Commissioner Gerald J. Mossinghoff, Banner's successor in office, was substituted as defendant. He has, in turn, been succeeded by Donald J. Quigg, but no formal substitution of Quigg has been made.

1. A titanium base alloy consisting essentially by weight of about 0.6% to 0.9% nickel, 0.2% to 0.4% molybdenum, up to 0.2% maximum iron, balance titanium, said alloy being characterized by good corrosion resistance in hot brine environments.

2. A titanium base alloy as set forth in Claim 1 having up to 0.1% iron, balance titanium.

3. A titanium base alloy as set forth in Claim 1 having 0.8% nickel, 0.3% molybdenum, up to 0.1% maximum iron, balance titanium.

The examiner's final rejection, repeated in his Answer on appeal to the Patent and Trademark Office (PTO) Board of Appeals (board), was on the grounds that claims 1 and 2 are anticipated (fully met) by, and claim 3 would have been obvious from, an article by Kalabukhova and Mikheyev, *Investigation of the Mechanical Properties of Ti-Mo-Ni Alloys*, Russian Metallurgy (Metally) No. 3, pages 130-133 (1970) (in the court below and hereinafter called "the Russian article") under 35 U.S.C. §§ 102 and 103, respectively. The board affirmed the examiner's rejection. However, it mistakenly proceeded on the assumption that all three claims had been rejected as anticipated under § 102 by the Russian article and ignored the obviousness rejection. On this appeal the PTO says it does not pursue the § 103 rejection further. Appellee proceeds on the basis that only the § 102 rejection is before us.

Both the examiner and the board had before them as evidence three affidavits by Rosenberg, Palmer, and Hall and a declaration by Minkler, by which they were not persuaded of patentability.

The Russian article is short (3 pages), highly technical, and contains 10 graphs as part of the discussion. As its title indicates, it relates to ternary Ti-Mo-Ni alloys, the subject of the application at bar. The examiner and the board both found that it would disclose to one skilled in the art an

alloy on which at least claims 1 and 2 read, so that those claims would not be allowable under the statute because of lack of novelty of their subject matter. Since the article does not specifically disclose such an alloy in words, a little thinking is required about what it would disclose to one knowledgeable about Ti-Ni-Mo alloys. The PTO did that thinking as follows:

Figure 1c [a graph] shows data for the ternary titanium alloy which contains Mo and Ni in the ratio of 1:3. Amongst the actual points on the graph is one at 1% Mo + Ni. At this point, the amounts of Mo and Ni would be 0.25% and 0.75% respectively. A similar point appears on the graph shown in Figure 2 of the article.

....

Appellants do not deny that the data points are disclosed in the reference. In fact, the Hall affidavit indicates at least two specific points (at 1% and 1.25% Mo + Ni) which would represent a description of alloys falling within the scope of the instant claims.

On that basis, the board found that the claimed alloys were not new, because they were disclosed in the prior art. It having been argued that the Russian article contains no disclosure of corrosion-resistant properties of any of the alloys, the board held:

The fact that a particular property or the end use for this alloy as contemplated by appellants was not recognized in the article is of no consequence.

It therefore held the Russian article to be an anticipation, noting that although the article does not discuss corrosion resistance, it does disclose other properties such as strength and ductility. The PTO further points out that the authors of the reference must have made the alloys to obtain the data points.

Being dissatisfied with the decision of the board, Titanium Metals Corporation of America, as assignee of the Covington and Palmer application, then brought an action in the District Court for the District of Columbia against the Commissioner pursu-

ant to 35 U.S.C. § 145, its complaint alleging that the board's decision "was erroneous and contrary to law," and making proffer of a certified copy of the application and all papers in the file thereof, together with a copy of the Russian article which was the sole basis of the PTO refusal to allow the claims. It prayed that the court adjudge it entitled to a patent containing claims 1-8 and authorize the Commissioner to grant such a patent. The Commissioner filed an answer denying that the applicants were the first inventors of the alloys claimed or entitled to a patent, alleging that the claims are not patentable under the law, and making proffer of the Examiner's Answer, the Board of Appeals' decision, and the prior art reference.

The case came on for trial on January 24, 1980, before the Honorable John G. Penn and was concluded in two and a half hours. The testimony of one witness was heard by the court, Dr. James C. Williams, professor at Carnegie-Mellon University in Pittsburgh and an expert in titanium metallurgy. His testimony was about equally divided between direct and cross examination.

At the conclusion of the plaintiff's case, the following exchange took place between the judge and the Associate Solicitor for the PTO:

THE COURT: All right. Mr. Tarring?

MR. TARRING: Your Honor, generally the position of the Patent Office is we rely on the position of the tribunals below, the examiner and the Board of Appeals and their decisions are both present in the exhibit which I submitted earlier. I was not quite sure whether you would prefer that we have a post-trial brief in the matter. If that's your preference we could do that or I could make an argument on the basis of the law right now. I don't know what your preference would be. Otherwise, I'm not going to call any witnesses.

THE COURT: You are not going to what?

MR. TARRING: I have no intention of calling any witnesses so it's really a matter of argument at this point, I think.

THE COURT: Of course, I have received your pre-trial briefs.

After further discussion, it was settled that both parties would file further briefs after the hearing transcript had been prepared. They were filed in April and May, 1980. On November 16, 1984, the District Court entered the Order appealed from followed on November 28 by a supporting memorandum opinion. January 10, 1985, the PTO filed its Notice of Appeal. This court has heard oral argument and received briefs.

The District Court Opinion

The trial court's memorandum opinion² having been published, we shall merely outline its contents.

After stating the nature of the action and the relief sought, Part I is a summarization of the contents of the patent specification, a statement of the issues, and of the PTO rejection which is stated both correctly as the examiner made it and incorrectly as the board assumed it to be. Part II is a statement of the District of Columbia Circuit Court of Appeals' attitude toward plaintiff's burden on review of the PTO board decisions in § 145 actions, namely, that it is a "heavy burden," "great weight" being given to the PTO decision because of its "expertise," a "thorough conviction" that it erred being required, as well as a lack of a "rational basis for its conclusions." In Part III is a brief discussion of "anticipation" under § 102 with citation of two cases from our predecessor Court of Customs and Patent Appeals, *In re Wilder*, 429 F.2d 447, 57 C.C.P.A. 1314, 166 USPQ 545 (1970), and *In re LeGrice*, 301 F.2d 929, 49 C.C.P.A. 1124, 133 USPQ 365 (1962), with emphasis placed on their holdings that an anticipatory reference must be an "enabling" reference, the implication being that the Russian article perhaps does not enable one to know all the things that the plaintiff's inventors disclosed in their application, such as the range limits of the alloying ingredients Mo and Ni and the

corrosion resistance. The court then states that after considering all of the affidavit and declaration evidence which was before the PTO, it still lacked the necessary "thorough conviction" required to overturn the PTO decision even though, left to its own judgment of the evidence, it would be willing to do so. It then reviewed the evidence of Dr. Williams taken before it. Dr. Williams was qualified as an expert in titanium metallurgy but not in patent law. The questions he was asked, however, pertained to the interpretation of patent claims, as quoted in the court's opinion. The court was of the view that his testimony "fully supports the arguments made by the plaintiff in this case" and found it "to be very persuasive." The court then concluded that claims 1-3 were not anticipated and that claim 3 was wrongly rejected as directed to obvious subject matter. In the court's view, Dr. Williams' testimony tipped the scales in favor of issuing a patent.

OPINION

1. Jurisdiction

This suit was brought in the district court pursuant to 35 U.S.C. § 145. Our jurisdiction rests on 28 U.S.C. § 1295(a)(4)(C) which provides as follows: § 1295. *Jurisdiction of the United States Court of Appeals for the Federal Circuit*

(a) The United States Court of Appeals for the Federal Circuit shall have exclusive jurisdiction—

....

(4) of an appeal from a decision of—

....

(C) a district court to which a case was directed pursuant to section 145 or 146 of title 35;

This case having been directed to the District Court for the District of Columbia by § 145, this court's jurisdiction is *exclusive* of the Court of Appeals for the District of

225 USPQ 673 (D.D.C.1984).

2. Reported sub nom. *Titanium Metals Corporation of America v. Mossinghoff*, 603 F.Supp. 87,

Columbia and is therefore governed by the precedents of this court and its predecessor courts. See *South Corporation v. United States*, 690 F.2d 1368, 215 USPQ 657 (Fed. Cir.1982).

Strange as it may seem to any district judge not to be governed by the precedents of his own Court of Appeals, that is the situation created by Congress in the Federal Courts Improvement Act of 1982, § 402 of Pub.L. 97-164, Apr. 2, 1982, 96 Stat. 37, effective Oct. 1, 1982, in the interest of promoting a uniform patent law by having only one Court of Appeals deciding questions of patent law, whether review be of decisions of the Patent and Trademark Office or of district court judgments in cases arising under the patent laws of the United States. Cf. § 1295(a)(1). We do not fault the district judge, however, for having stated the precedents of his own circuit in this § 145 case because this is one of the first occasions we have had to review a judgment in such a case. Nor do we need to determine whether we should apply those precedents here.

2. The rejections under review

Tracing the PTO rejections under review below, we encounter confusion. Although we are reviewing the judgment (in the form of an order) of the district court,³ the effect of that order is to hold that the PTO's rejections of claims 1-3 were in error. The actual holding of the district court was:

The Court concludes that Claims 1, 2 and 3 should not have been rejected on the basis of anticipation pursuant to 35 U.S.C. § 102. Moreover, the Court concludes that Claim 3 should not have been rejected as being obvious pursuant to 35 U.S.C. § 103.

Thus, the Court finds as a fact and concludes as a matter of law that the

decision of the Board of Appeals was in error. The testimony of Dr. Williams, which remains uncontradicted, adds sufficient weight to the plaintiff's side to tip the scales and, in the Court's view, to result in clear and convincing evidence that the application should not have been rejected.

Thus, the court deemed all three claims to have been rejected for anticipation under § 102. The examiner never so rejected claim 3. The board opinion, as above noted, erroneously assumed that he had, never gave any special or separate attention to claim 3, never discussed obviousness or § 103, and concluded its opinion with the words "The decision of the examiner is affirmed." The board made no new rejection, as it might have done, under 37 C.F.R. § 196(b). Under these circumstances, we shall assume that the board intended to, and did, affirm *only* the rejection that the examiner had made, as we have stated at the beginning, and that the only rejection outstanding against claim 3 is for obviousness under § 103.

The district court assumed there were *two* outstanding rejections against claim 3. We have reduced it to one.

The appellee, because it quite evidently suits its argument best, has preferred to ignore the § 103 rejection of claim 3, but we do not because it exists in the official record.

[1] The PTO brief says the Commissioner "is not pursuing" the § 103 rejection in this court, but it is before us whether or not pursued by the PTO. The PTO Solicitor developed a new theory in his brief, never propounded by either the examiner or the board, to support a § 102 rejection of claim 3 on the Russian article,⁴ but that

3. The Order entered Nov. 16, 1984, after preliminary recitations, reads as follows:

ORDERED that the Commissioner of Patents and Trademarks is authorized to issue to plaintiff, Titanium Metals Corporation of America, as assignee and owner of application Serial No. 598,935, United States Letters Patent on Titanium Alloy including Claims Nos.

1, 2 and 3 in due form as prescribed by the Patent Laws of the United States.

The ultimate issue actually before us is *whether the patent laws permit* the Commissioner to issue such a patent.

4. Resting on the fact that the Russian Article discloses an alloy containing 0.75% Ni and 0.25% Mo, the Solicitor's argument is as follows:

was clearly beyond his province and we disregard it as amounting to a new ground of rejection. We also disregard it as contrary to many holdings of this court and its predecessors that anticipation under § 102 can be found only when the reference discloses exactly what is claimed and that where there are differences between the reference disclosure and the claim, the rejection must be based on § 103 which takes differences into account. D. Chisum, *Patents* § 3.02.

We have undertaken to settle the question whether we are dealing with one ground of rejection or two for the further reason that the standard of review of this court may vary in accordance with what the rejection is and whether it is considered to be a finding of fact or a conclusion of law. We have held that anticipation is a finding of fact, reviewable under the "clearly erroneous" standard, *Shatterproof Glass Corp. v. Libbey-Owens Ford Co.*, 758 F.2d 613, 225 USPQ 634 (Fed.Cir. 1985), and that obviousness is a conclusion of law not subject to that restraint, but is freely reviewable. *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 1344, 220 USPQ 777, 782 (Fed.Cir.1984). That may make a difference in our review.

3. The merits

Finding, as we do, that claim 3 was never purposefully rejected under § 102, both the board and the district court being confused about that fact, we are left with the propriety of the rejection of claims 1 and 2 under § 102 and the rejection of claim 3 under § 103, both rejections having been held by the district court to have been erroneous. That necessarily follows from the court's conclusion "that the Claims are patentable." We find that conclusion contrary to

Moreover, this alloy falls within the scope of claim 3, which specifies 0.8% nickel, 0.3% molybdenum, up to 0.1% iron and balance titanium. Inasmuch as this claim specifies the content of nickel and molybdenum to a tenth of a percent, the claim, given the broadest reasonable interpretation, would cover alloys the amounts of whose contents would correspond to the claim language when ex-

statutory law and will deal with the two grounds of rejection separately.

A. Anticipation, § 102

From consideration of the trial court's memorandum opinion, we are unable to determine whether it erred because of misconstruction of the claims, misreading of what the reference discloses, lack of proper advice on the requirements of the patent statute respecting patentability, or the technical legal meaning of "anticipation," a term which some courts have erroneously used from time to time.

We are left in no doubt that the court was impressed by the totality of the evidence that the applicants for patent had discovered or invented and disclosed knowledge which is not to be found in the reference, nor do we have any doubt about that ourselves. But those facts are beside the point. The patent law imposes certain fundamental conditions for patentability, paramount among them being the condition that what is sought to be patented, as determined by the claims, be new. The basic provision of Title 35 applicable here is § 101, providing in relevant part: "Whoever invents or discovers any *new* ... composition of matter, or any *new* ... improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title." (Emphasis ours.) The title of the application here involved is "Titanium Alloy," a composition of matter. Surprisingly, in all of the evidence, nobody discussed the key issue of whether the alloy was new, which is the essence of the anticipation issue, including the expert Dr. Williams. Plaintiff's counsel, bringing Dr. Williams' testimony to its climax, after he had explained the nature of the ingredients, the alloys made therefrom, and their superior corrosion resistance in hot brine,

pressed in tenths of a percent. Following the usual convention of rounding off hundredths to tenths by increasing the tenths digit by one when the hundredths digit to be dropped is five or greater, the alloy of the Russian article, expressed in tenths of a percent, would contain 0.8% nickel, 0.3% molybdenum and balance titanium, corresponding to the alloy specified in tenths of a percent in claim 3.

etc., repetitively asked him such questions as "Does the [Russian] article *direct you* as one skilled in the art to a titanium alloy having nickel present in an amount between .6 and .9 percent molybdenum in an amount between .2 and .4 percent?" (emphasis ours) followed by "Is there anything mentioned in the article about corrosion resistance?" Of course, the answers were emphatically negative. But this and like testimony does not deal with the critical question: do claims 1 and 2, to which the questions obviously relate, *read on or encompass* an alloy which was already known by reason of the disclosure of the Russian article?

Section 102, the usual basis for rejection for lack of novelty or anticipation, lays down certain principles for determining the novelty required by § 101, among which are the provisions in § 102(a) and (b) that the claimed invention has *not* been "described in a printed publication in this or a foreign country," either (a) before the invention by the applicant or (b) more than one year before the application date to which he is entitled (strictly a "loss of right" provision similar to novelty). Either provision applies in this case, the Russian article having a date some 5 years prior to the filing date and its status as "prior art" not being questioned. The PTO was never specific as to what part of § 102 applies, merely rejecting on § 102. The question, therefore, is whether claims 1 and 2 encompass and, if allowed, would enable plaintiff-appellee to exclude others from making, using, or selling an alloy *described in* the Russian article. See 35 U.S.C. § 154. *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 USPQ 781 (Fed.Cir.1983).

To answer the question we need only turn to the affidavit of James A. Hall, a metallurgist employed by appellee's Tl-MET Division, who undertook to analyze the Russian article disclosure by calculating the ingredient percentages shown in the graph data points, which he presented in tabular form. There are 15 items in his table. The second item shows a titanium base alloy containing 0.25% by weight Mo and 0.75% Ni and this is squarely within

the ranges of 0.2-0.4% Mo and 0.6-0.9% Ni of claims 1 and 2. As to that disclosed alloy of the prior art, there can be no question that claims 1 and 2 read on it and would be infringed by anyone making, using, or selling it. Therefore, *the statute prohibits* a patent containing them. This seems to be a case either of not adequately considering the novelty requirement of the statute, the true meaning of the correlative term "anticipation," or the meaning of the claims.

By reason of the court's quotations from cases holding that a reference is not an anticipation which does not enable one skilled in the art to practice the claimed invention, it appears that the trial court thought there was some deficiency in the Russian article on that score. Enablement in this case involves only being able to make the alloy, given the ingredients and their proportions without more. The evidence here, however, clearly answers that question in two ways. Appellee's own patent application does not undertake to tell anyone how to make the alloy it describes and seeks to patent. It assumes that those skilled in the art would know how. Secondly, appellee's expert, Dr. Williams, testified on cross examination that given the alloy information in the Russian article, he would know how to prepare the alloys "by at least three techniques." Enablement is not a problem in this case.

As we read the situation, the court was misled by the arguments and evidence to the effect that the inventors here found out and disclosed in their application many things that one cannot learn from reading the Russian article and that this was sufficient in law to justify granting them a patent for their contributions—such things as what good corrosion resistance the claimed alloys have against hot brine, which possibly was not known, and the range limits of the Ni and Mo content, outside of which that resistance diminishes, which are teachings of very useful information. These things the applicants teach the art and the Russian article does not. Indeed, appellee's counsel argued in his open-

ing statement to the trial court that the PTO's refusal of a patent was "directly contrary to the requirement of Article I, Section 8, of the Constitution," which authorizes Congress to create a patent law. But throughout the trial counsel never came to grips with the real issues: (1) what do the claims cover and (2) is what they cover new? Under the laws Congress wrote, they must be considered. Congress has not seen fit to permit the patenting of an old alloy, known to others through a printed publication, by one who has discovered its corrosion resistance or other useful properties, or has found out to what extent one can modify the composition of the alloy without losing such properties.

[2] It is also possible that the trial court did not properly interpret the claims and took them to be directed only to the applicants' discoveries about the properties of the alloys instead of to the alloys themselves, as they are, possibly because of the phrase at the end of claim 1, "characterized by good corrosion resistance in hot brine environments," which applies to the other two dependent claims also. No light is shed by its opinion on what the court thought the claims mean as the opinion does not construe the claims. Until it has been definitely determined what subject matter is being claimed, it is not known what it is that the PTO held to be unpatentable. Claim interpretation, which is the logical starting point of the analysis, is a question of law free from the clearly erroneous standard of review. *Raytheon Co. v. Roper Corp.*, 724 F.2d 951, 956, 220 USPQ 592, 596 (Fed.Cir.1983). It is the correct and necessary construction of all three claims that they simply define titanium base alloys. Claims 1 and 2 state certain narrow limits within which the alloying ingredients, Mo and Ni, are present and necessarily cover a number of alloys. Claim 3 is specific to a single alloy. This said, it is immaterial, on the issue of their novelty, what inherent properties the alloys have or whether these applicants discovered certain inherent properties.

The trial court and appellee have relied on *In re Wilder*, supra, but they have both failed to note those portions of that opinion most relevant to the present case. The issue there, as here, was anticipation of certain claims. Wilder argued "that even though there may be a technical anticipation, the discovery of the new property and the recitation of this property in the claims 'lends patentable novelty' to the claims." The court answered:

However, recitation, in a claim to a composition, of a particular property said to be possessed by the recited composition, be that property newly-discovered or not, does not necessarily change the scope of the subject matter otherwise defined by that claim. [429 F.2d at 450, 57 C.C.P.A. 1314, 166 UPSQ at 548.]

The court in that case also said:

[W]e start with the proposition that claims cannot be obtained to that which is not new. This was the basis of the holding in *In re Thuan* [135 F.2d 344, 30 C.C.P.A. 979, 57 USPQ 324 (CCPA 1943)]. It was the law then, is now and will be until Congress decrees otherwise. [Id.]

It is also an elementary principle of patent law that when, as by a recitation of ranges or otherwise, a claim covers several compositions, the claim is "anticipated" if one of them is in the prior art. *In re Petering*, 301 F.2d 676, 682, 49 C.C.P.A. 993, 1001, 133 USPQ 275, 280 (1962).

[3] For all of the foregoing reasons, the court below committed clear error and legal error in authorizing the issuance of a patent on claims 1 and 2 since, properly construed, they are anticipated under § 102 by the Russian article which admittedly discloses an alloy on which these claims read.

B. Obviousness, § 103

[4] Little more need be said in support of the examiner's rejection of claim 3, affirmed by the board, on the ground that its more specific subject matter would have been obvious at the time the invention was

made from the knowledge disclosed in the reference.

As admitted by appellee's affidavit evidence from James A. Hall, the Russian article discloses two alloys having compositions very close to that of claim 3, which is 0.3% Mo and 0.8% Ni, balance titanium. The two alloys in the prior art have 0.25% Mo—0.75% Ni and 0.31% Mo—0.94% Ni, respectively. The proportions are so close that prima facie one skilled in the art would have expected them to have the same properties. Appellee produced no evidence to rebut that prima facie case. The specific alloy of claim 3 must therefore be considered to have been obvious from known alloys.

Conclusion

For the foregoing reasons, the decision and order of the district court holding that claims 1, 2, and 3 are directed to patentable subject matter and authorizing the issuance of a patent thereon were clearly erroneous and are reversed.

REVERSED.



Angelina FRANTZ, Petitioner,

v.

OFFICE OF PERSONNEL
MANAGEMENT,
Respondent.

Appeal No. 85-603.

United States Court of Appeals,
Federal Circuit.

Dec. 4, 1985.

Retired federal employee appealed from decision of the Merit Systems Protection Board, 21 M.S.P.R. 652, which reversed initial decision of presiding official

and upheld ruling of the office of personnel management which denied employee's application to amend her survivor's annuity election. The Court of Appeals, Nies, Circuit Judge, held that Board's decision was not supported by substantial evidence.

Reversed and remanded.

United States §39(15)

Decision of the Merit Systems Protection Board upholding ruling which denied retired federal employee's application to amend her survivor's annuity election was not supported by substantial evidence; employee had received incorrect information by agency's personnel counselors and on retirement application form, and a reasonable person would have remained confused even though subsequent confirmation and information sheets mailed to employee contained correct information. 5 U.S.C.A. § 7703(c).

John F. Schuck, Keogh, Marer & Flicker, Palo Alto, Cal., for petitioner.

John S. Groat, Commercial Litigation Branch, Dept. of Justice, Washington, D.C., argued for respondent. With him on brief were Richard K. Willard, Acting Asst. Atty. Gen., David M. Cohen, Director and Robert A. Reutershan.

Before NIES, Circuit Judge, COWEN, Senior Circuit Judge, and BISSELL, Circuit Judge.

NIES, Circuit Judge.

This is an appeal from the final decision of the Merit Systems Protection board (MSPB or board), Docket No. SF08318310928, reported at 21 M.S.P.R. 652 (1984). The full board reversed the initial decision of the presiding official and upheld the ruling of the Office of Personnel Management (OPM), which denied petitioner's application to amend her survivor's annuity election. We reverse the board's decision and remand the case with instructions to accept petitioner's application.

capital stock taxes, transportation taxes, or any State and local taxes. (The treatment of State and local real and personal property taxes are covered in Article XIX, paragraph 33, of the Housing Contract.)

(d) The eligible builder shall promptly notify the Contracting Officer of all matters pertaining to Federal taxes that reasonably may result in either an increase or decrease in the contract price. The eligible builder shall take action as directed by the Contracting Officer, and the contract price shall be equitably adjusted to cover the cost of such action, including any interest, penalty, and reasonable attorney's fees, such adjustment to be processed as a change order.



57 CCPA

Application of David W. WILSON.
Patent Appeal No. 8271.

United States Court of Customs
and Patent Appeals.
May 7, 1970.

Proceeding on patent application serial No. 332,321. The Patent Office Board of Appeals affirmed rejection of claims 1-4, 8-10, and 15-21, and applicant appealed. The Court of Customs and Patent Appeals, Lane, J., held that Patent Office Board of Appeals' disregard of term "incompatible" as used in claims relating to treatment of power driven rotary brushes with "incompatible" resins rendered its conclusion of obviousness unsupported.

Reversed.

1. Patents ©101(5)

Specification with respect to composition for treatment of power driven rotary brushes was sufficient to support claims in issue. 35 U.S.C.A. § 112.

2. Patents ©51(1)

All words in claim must be considered in judging patentability of claim against prior art. 35 U.S.C.A. § 103.

3. Patents ©18, 101(6)

If no reasonably definite meaning can be ascribed to certain terms in claim, subject matter does not become obvious, but claim becomes indefinite. 35 U.S.C.A. § 103.

4. Patents ©113(6)

Patent Office Board of Appeals' disregard of term "incompatible" as used in claims relating to treatment of power driven rotary brushes with "incompatible" resins rendered its conclusion of obviousness unsupported. 35 U.S.C.A. § 103.

Oberlin, Maky, Donnelly & Renner, William E. Thomson, Jr., John C. Oberlin, Cleveland, Ohio, attorneys of record, for appellant.

Joseph Schimmel, Washington, D. C., for the Commissioner of Patents. Raymond E. Martin, Washington, D. C., of counsel.

Before RICH, Acting Chief Judge, ALMOND, BALDWIN and LANE, Judges, and FORD, Judge, United States Customs Court, sitting by designation.

LANE, Judge.

This appeal is from the decision of the Patent Office Board of Appeals, which affirmed the rejection of claims 1-4, 8-10, and 15-21 in appellant's application serial No. 332,321, filed November 5, 1963, for "Treated Brush and Brush Treating Composition." Four other claims have been allowed. We conclude that the board's decision must be reversed.

THE DISCLOSURE

Appellant's disclosure discusses certain problems in the treatment of power-driven rotary brushes. According to the disclosure, it was desirable to pro-

duce a composition for treating the brush bristles, whereby the ability of the bristles to hold abrasive particles would be enhanced. It discloses that the treatment composition should have a strength of adhesion to the brush bristles sufficiently great to prevent such composition from transferring excessively to the object being brushed; that the treatment material should wear at substantially the same rate as the brush bristles; that the material should have a high temperature softening point; and that the strength of adhesion between the treating composition and the abrasive particles must be sufficient to withstand the centrifugal force which normally would tend to throw the abrasive outwardly from the brush. The disclosure states that previously known brush-treating compositions did not accomplish all these objectives and had a tendency to dry and lose their tackiness over a period of time, thus becoming useless for holding abrasive particles on the bristles.

The disclosure states that appellant discovered that a composition having a high temperature softening point and a high degree of tackiness could be produced if a film-forming resin were blended with a tackifier resin which was incompatible with (insoluble in) the film-forming resin. The resulting composition would have two distinct phases: a continuous phase comprised of film-forming resin, either alone or saturated with a small quantity of tackifier resin, and a dispersed phase comprised of small particles of tackifier resin. The two resins may be either completely or partially incompatible, and the disclosure states that the more insoluble the resins, the greater the tack which the composition possesses. Appellant also disclosed that certain plasticizers could be added to render the resins more incompatible, thus further increasing the tack of the composition. Finally, appellant stated that the entire composition could be dissolved in a volatile solvent to allow easy application to the brush, the solvent

being one which quickly evaporates upon such application.

The specification contains a list of suitable film-forming resins, including ethyl cellulose, nitro cellulose, cellulose acetate, polyvinyl acetate and cis-polyisoprene, among other materials. A list of tackifiers is given, including certain esters of abietic acid, polyvinyl ethyl ether, coumarone indene resin and terpene resins. A list of plasticizers is also given. The specification then gives four examples showing how to combine various film-formers, tackifiers, plasticizers and solvents to obtain brush-treating compositions of the desired characteristics, and explains how to apply them to brushes.

THE CLAIMS

In view of the result we reach, we find that claims 1 and 8 are representative:

1. A two-phase brush treating composition having a high softening point and sufficient tack to retain abrasive material firmly adhered to brush fill material comprising a film-forming resin and a tackifier resin which is incompatible with said film-forming resin, said two phases comprising a continuous phase formed of said film-forming resin and a dispersed phase formed of small particles of tackifier resin.

8. In combination, a rotary brush having brush fill material and a two-phase pressure sensitive adhesive brush treating composition adhered thereto having a high softening point and sufficient tack to retain abrasive material firmly adhered to such brush fill material comprising a film-forming resin and a tackifier resin which is incompatible with said film-forming resin, said two phases comprising a continuous phase formed of said film-forming resin and a dispersed phase formed of small particles of tackifier resin.

The remaining claims on appeal are narrower, containing recitations of specific resins, plasticizers, etc.

THE PRIOR ART

Grantham¹ relates to coatings for film material and discloses a coating composition comprising a cellulose derivative film-former, a blending resin, a plasticizer, and an organic solvent. Grantham teaches that the blending agent and the film-former should be compatible.

Depew² teaches the preparation of emulsions consisting of a continuous phase of water and a discontinuous phase of elastomer particles and particles of a volatile hydrocarbon, with vulcanizing ingredients and other additives dispersed in the hydrocarbon particles. Depew then states that where a dispersion with additional adhesive properties is desired, an adhesive, such as certain of the tackifier resins disclosed by appellants, can be added to the emulsion, and that

[t]his adhesive can be water soluble or dispersed as particles. * * *

The chemistry of the adhesive component is not critical to this invention. The important thing is that the deposited film shall be tacky and adhesive.

Sergi³ relates to adhesives suitable for installation of floor-covering products such as linoleum. Sergi's composition consists of a tackifier resin dispersed in a latex binder; the tackifier and latex must be compatible with one another, according to the Sergi disclosure.

Vaughan⁴ teaches impregnating a fibrous buffing wheel with an aqueous emulsion consisting of a tacky resin and an emulsifier or stabilizer such as glue or gum.

THE BOARD

The board found the composition claims to be unpatentable over Depew, Sergi or Grantham under 35 U.S.C. § 103.

The board reached this conclusion after noting that each of the three references shows some of the film-formers, tackifiers, plasticizers and solvents appearing in appellant's lists. The board found that the recited limitation of incompatibility was too relative a term to distinguish over the compositions of the references.

The board found that the claims to the treated brush were unpatentable, under 35 U.S.C. § 103, over Vaughan in view of Sergi or Depew. Since Vaughan shows treating brushes, the board apparently considered it obvious to treat brushes with compositions which it thought were made obvious by Sergi or Depew.

The board also affirmed the rejection of certain claims for being "broader than the disclosure" under 35 U.S.C. § 112. The board's basis for this rejection was that the specification did not provide adequate guidelines for making a selection among the various disclosed ingredients, nor among other materials which are not disclosed but would be included by the claims.

OPINION

[1] We first treat the rejection under section 112. This rejection is in effect an attack on the specification as being insufficient to teach how to practice the broad invention claimed. The rejection is therefore under the first paragraph of section 112. The board's position, as mentioned above, was that the specification did not teach how to select ingredients so that the desired incompatibility would result. We disagree with the board's position on this point. First of all, appellant provided four examples, each specifying the nature and amounts of materials to be used. Secondly, the record indicates that it involves only routine experimentation to find out which resins are incompatible. The examiner admitted as much when,

1. U.S.Pat. 3,051,870, issued August 28, 1962.

2. U.S.Pat. 2,933,469, issued April 19, 1960.

3. U.S.Pat. 3,015,638, issued January 2, 1962.

4. U.S.Pat. 2,890,136, issued June 9, 1959.

with regard to obviousness, he said "selecting the proper tackifier and film-forming resin from those listed in the references to form an emulsion or two-phase composition would be within the expected skill of the art and would merely involve routine experimentation." We conclude that appellant has provided a sufficient specification to support the claims here in issue.

[2-4] Turning to the rejection of the claims for obviousness, we again disagree with the board's position. The board has disregarded the term "incompatible," as used in the claims, because it is "too relative" to distinguish over the compositions of the references. Appellant contends this limitation is essential in defining his invention. There has been no rejection here for indefiniteness, under the second paragraph of section 112. Rather than reject the claims as indefinite, the board chose to ignore the language it considered indefinite, and proceeded as though that language were not in the claims. The board said, in effect, that since we do not know what "incompatible" means, and the rest of the claim defines obvious subject matter, there is no basis for concluding unobviousness. This reasoning is incorrect. All words in a claim must be considered in judging the patentability of that claim against the prior art. If no reasonably definite meaning can be ascribed to certain terms in the claim, the subject matter does not become obvious—the claim becomes indefinite. In the present case, we think the term "incompatible" is defined with reasonable definiteness in the specification. While it is true that the word is not perfectly precise, under the circumstances of the present case there appears to be no other way for appellant to describe his discovery. In any event, the ignoring of this term by the board renders its conclusion of obviousness unsupported. None of the references discloses a two-phase composition of incompatible resins or suggests that such a composition would have the properties disclosed by appellant. Grantham and Sergi both ex-

pressly teach that the components of their compositions should be compatible. Neither Vaughan nor Depew uses a resin as the continuous phase. While Depew states, as quoted above, that the adhesive material may be dispersed as particles in the continuous phase, and hence be incompatible with the continuous phase material, it cannot be ignored that Depew's continuous phase is of water, not a film-forming resin as recited in appellant's claims. Furthermore, there is no suggestion in Depew or Vaughan that there are advantages in using an adhesive which is insoluble in the aqueous phase. There is nothing of record, therefore, from which we can properly conclude that the subject matter of appellant's claims would have been obvious at the time of his invention. The decision of the board must accordingly be reversed.

Reversed.



BY CCEA

COSMETICALLY YOURS, INC.,
Appellant,

v.

CLAIROL INCORPORATED, Appellee.

Patent Appeal No. 8296.

United States Court of Customs
and Patent Appeals.

May 7, 1970.

Appeal from decision of the Trademark Trial and Appeal Board, Opposition No. 44,363, sustaining an opposition to the application by appellant to the registration of the words "Look Alive" as a trademark for "lipstick". The Court of Customs and Patent Appeals, Rosenstein, J., held that absent a counterclaim for cancellation, it was not open to applicant to prove abandonment of opposer's registered "Come Alive" mark;

(contractual one-year limitation on submitting claims is enforceable even though the Contract Disputes Act contained no limitations period governing the submission of claims).

The ten-year period set forth in the regulations at 41 C.F.R. § 101-41.504(b) (and in the cognate statute, 31 U.S.C. § 3716), is merely the period in which the government is permitted to assert, via the offset procedure, what it believes is a valid debt. After the expiration of the contractual period for refund applications, however, there is no valid debt to collect, since the airline no longer has an obligation to pay a refund, just as it has no obligation to pay a refund if the government does not satisfy any other contractual terms governing refund applications that do not conflict with any statute or transportation regulation.

It is important to keep in mind that there is no principle of law that requires an airline company to permit any traveler to obtain a refund for a ticket that is not used. The airlines could treat travelers just like purchasers of football tickets—persons who have a right to attend a particular event but have no right to a refund if, for some reason, they do not attend. In most cases, the airlines have adopted a more generous approach by permitting refunds under particular circumstances. But the fact that the airlines have created qualified refund rights as part of their transportation contracts with the public does not mean that there is a presumptive right to a refund and that the airlines' restrictions on the refund claim process must be viewed with a jaundiced eye.

There are good reasons for the airlines to impose controls on their liability for unused ticket refunds, and the traveling public, including the government, presumably benefits from those restrictions in the form of lower fares than would be charged if the airlines offered refunds on an open-ended, unqualified basis. Moreover, the periods within which the refunds at issue in this case could be sought were quite reasonable—even generous. The seven plaintiff airlines with time limitations on refund applications required the claims to be filed within one to five years, with most of them permitting claims to be

filed three years or more after the date of the ticketed travel. That much time should be ample for any individual or organization with even a semblance of an orderly accounting system to prepare and file refund claims. The government, however, has now effectively forced the airlines to provide it special treatment with regard to refunds, and to do so for free. Any restriction on freedom of contract should be viewed with skepticism; this one is particularly distasteful, as it has the effect of allowing the government, cost free, to force the airlines to bear the burden of the government's inefficiency. Absent far more compelling support in statute or regulation for this instance of governmental special pleading, I cannot endorse such a result.



**MODINE MANUFACTURING
COMPANY, Appellant,**

v.

**UNITED STATES INTERNATIONAL
TRADE COMMISSION,**

Appellee,

and

**Showa Aluminum Corporation and
Showa Aluminum Corporation
of America,**

and

**Mitsubishi Motors Corporation
and Mitsubishi Motors
Sales of America,**

and

**Mitsubishi Heavy Industries, Ltd.
and Mitsubishi Heavy Industries
America, Inc., Intervenor.**

No. 93-1513.

United States Court of Appeals,
Federal Circuit.

Feb. 5, 1996.

Patentee for condenser used in automotive air conditioning appealed from decision

of International Trade Commission holding that Tariff Act was not violated by importation of allegedly infringing condensers, but that patent at issue was valid and enforceable. Respondents before Commission, which were entities that manufactured and sold allegedly infringing condensers, intervened on appeal. The Court of Appeals, Pauline Newman, Circuit Judge, held that: (1) term "flat side walls" referred only to structure of tubes in condenser and did not require that tubes lack attachments to their interior or exterior surfaces; (2) term "relatively small hydraulic diameter," in reference to condenser's flow path, did not extend to range of 0.015 to 0.07 inch but was not limited to exact range, set forth in specification, of 0.015 to 0.04 inch; (3) remand was required to determine whether any allegedly infringing condensers literally infringed patent or infringed under doctrine of equivalents when claim was properly construed; (4) infringement claims were not precluded under statutory on-sale bar; (5) patent was not invalid for obviousness; (6) patent was not invalid for indefiniteness; and (7) patentee did not engage in inequitable conduct.

Affirmed in part, vacated in part, and remanded.

Mayer, Circuit Judge, dissented.

1. Patents \S 314(5)

Disputes as to meaning and scope of terms as used in patent claims are determined as matter of law, based on patent specification and prosecution history if it is in evidence.

2. Patents \S 101(2)

Term "flat side walls," as used in patent claim to describe tubes which were part of patented condenser used in automotive air conditioning, meant only that tube structure was flat, and did not prohibit presence of fins, webs, or other attachments to either interior or exterior surfaces.

See publication Words and Phrases for other judicial constructions and definitions.

3. Patents \S 101(3, 4), 167(1.1)

Ordinarily, patent claim element that is claimed in general descriptive words, when numerical range appears in specification and in other claims, is not limited to numbers in specification or other claims; it is usually incorrect to read numerical precision into claim from which it is absent, particularly when other claims contain numerical limitation.

4. Patents \S 101(4), 165(4)

When limitation is included in several patent claims but is stated in terms of apparently different scope, there is presumption that difference in scope is intended and is real; such presumption can be overcome, but evidence must be clear and persuasive.

5. Patents \S 168(2.1)

It is incorrect to construe patent claim as encompassing scope that was relinquished in order to obtain allowance of another claim, despite difference in words used.

6. Patents \S 167(1.1)

Although description of preferred embodiment in specification does not limit patent claims to that embodiment, claims are not necessarily entitled to scope broader than that embodiment when preferred embodiment is described in specification as invention itself.

7. Patents \S 101(2)

Term "relatively small hydraulic diameter," as used in patent claim to describe flow paths in patented condenser used in automotive air conditioning, did not extend to range of 0.015-0.070 inch, as that range was removed from specification on refiling of patent application, but range was not limited to exact range of 0.015-0.040 inch, which was range set forth in specification as preferred embodiment, since specification and other claims referred to range of "about" 0.015-0.040 inch.

See publication Words and Phrases for other judicial constructions and definitions.

8. Patents \S 168(2.1)

Even if patentee was not required to drop larger range of 0.015-0.070 inch from

claims describing flow path of patented condenser as having "relatively small hydraulic diameter," in favor of reference to range of 0.015-0.040, during prosecution of patent, patentee was not permitted to assert that diameter could extend to 0.070 inch in subsequent infringement action, as change was conspicuous and unambiguous.

9. Patents \S 165(5)

Fact that patent incorporated by reference into patent for condenser used in automotive air conditioning defined term "relatively small" as 0.07 inch or less did not require construction of claim in patent for condenser which referred to flow path of "relatively small hydraulic diameter" as encompassing diameter range of up to 0.07 inch, where range of 0.015-0.07 inch was removed from grandparent of condenser patent and replaced with range of 0.015-0.04 inch.

10. Patents \S 167(1.1)

Where specification accompanying patent for condenser used in automobile air conditioning used term "about" in reference to range of flow path diameter of "about" 0.015 to 0.04 inch, range was to be given reasonable scope and had to be viewed by decisionmaker as it would be understood by persons experienced in field of invention.

11. Patents \S 237

There is no equitable threshold for determination of factual question of patent infringement by equivalency.

12. Patents \S 312(6)

Finding of administrative law judge that accused condensers did not infringe patented condenser under doctrine of equivalents because accused condensers did not function in same way due to their internal fins, was against heavy weight of evidence, in light of patentee's substantially un rebutted evidence that presence of internal fins did not substantially change way condensers functioned.

13. Patents \S 168(2.1)

Prosecution history estoppel limits application of doctrine of equivalents to question of patent infringement, even when func-

tion/way/result or other test of equivalency is met by accused devices.

14. Patents \S 168(2.1)

Prosecution history estoppel implements principle that patentee cannot obtain, in infringement suit, protection of subject matter that was relinquished in order to obtain allowance of other subject matter during prosecution of patent application; standard for determining whether particular subject matter was relinquished and was material is objective one which Court of Appeals determines as matter of law, and is based on reasonable reading, by person of skill in field of invention, of entire prosecution history.

15. Patents \S 237

Available range of equivalency which could be asserted by patentee in infringement action, in connection with hydraulic diameter of patented condenser used in automotive air conditioning, was limited to hydraulic diameter of condenser which was deemed prior art and was factor in limiting range of patent at issue; patent's range did not extend to range first asserted in grandparent, as assertion of larger range was barred by prosecution history estoppel.

16. Patents \S 75

Patentee's claims of infringement as to patented condenser used in automotive air conditioning were not precluded under statutory on-sale bar, as invention claimed in patent was described and enabled in parent application filed before any potential use or sale. 35 U.S.C.A. \S 120.

17. Patents \S 90(1)

Later patent application is entitled to earlier filing date for all common subject matter that is contained in earlier application, whether subject matter appears in body of specification or in claims or drawings. 35 U.S.C.A. \S 120.

18. Patents \S 162.22

Patent for condenser used in automotive air conditioning was not invalid on grounds of obviousness, absent teaching or suggestion that prior art condensers be modified in manner of patented condenser, considering superior results achieved, long-felt need for

condenser which would overcome prior limitations, and patented condenser's commercial success. 35 U.S.C.A. § 103.

19. Patents ⇐101(2)

When patent claims are amenable to more than one construction, they should when reasonably possible be interpreted so as to preserve their validity.

20. Patents ⇐101(2)

Construction of claims of patent for condenser used in automotive air conditioning to define term "relatively small," in connection with condenser's hydraulic diameters, as "about" 0.015 to 0.04 inch did not render claims invalid on grounds of indefiniteness, as claims did not require exact numerical limit of diameter. 35 U.S.C.A. § 112.

21. Patents ⇐101(3)

Mathematical precision of patent claim should not be imposed for its own sake; patentee has right to claim invention in terms that would be understood by persons of skill in field of invention.

22. Patents ⇐97

Both materiality and intent are essential factual predicates of inequitable conduct in prosecution of patent, and each must be proved by clear and convincing evidence.

23. Patents ⇐97

Patentee's allegedly improper selection of data to use in patent application did not constitute inequitable conduct in prosecution of patent, absent material withholding or intent to deceive.

Richard J. Hoskins, Schiff, Hardin & Waite, Chicago, Illinois, argued for appellant. With him on the brief were Thomas B. Quinn, Stuart I. Graff, Patricia J. Thompson and Randall M. Whitmeyer. Also on the brief were V. James Adduci, II, Charles F. Schill and Peter B. Martine, Adduci, Mastriani, Schaumberg & Schill, Washington, DC.

Matthew T. Bailey, Office of General Counsel, U.S. International Trade Commis-

sion, Washington, DC, argued for appellee. With him on the brief were Lyn M. Schlitt, General Counsel and James A. Toupin, Assistant General Counsel. John S. Kiernan, Debevoise & Plimpton, New York City, argued for intervenor, Showa Aluminum Corporation of America. With him on the brief were James E. Armstrong, III, Ronald F. Naughton and Joseph J. Zito, Armstrong, Westerman, Hattori, McLeland & Naughton, Washington, DC.

Robert E. Montgomery, Jr. and Robert P. Parker, Paul, Weiss, Rifkind, Wharton & Garrison, Washington, DC, were on the brief for intervenor, Mitsubishi Heavy Industries, Ltd. and Mitsubishi Heavy Industries America, Inc.

Terrell C. Birch, Bernard L. Sweeney, Charles Gorenstein and Terry L. Clark, Birch, Stewart, Kolasch & Birch, Falls Church, Virginia, were on the brief for Mitsubishi Motors Corporation and Mitsubishi Motor Sales of America. Of counsel was Robert J. Kenny.

Before NEWMAN, MAYER, and CLEVELANGER, Circuit Judges.

Opinion for the court filed by Circuit Judge NEWMAN. Circuit Judge MAYER dissents without opinion.

PAULINE NEWMAN, Circuit Judge.

Modine Manufacturing Co. appeals the decision of the United States International Trade Commission,¹ holding that section 837 of the Tariff Act, 19 U.S.C. § 1837, was not violated by the importation of certain automotive condensers. The respondents before the Commission, who participate as intervenors in this appeal, manufacture in Japan and import, sell, and use the accused condensers in the United States: Showa Aluminum Corporation and Showa Aluminum Corporation of America; Mitsubishi Motors Corporation and Mitsubishi Motor Sales of America; and Mitsubishi Heavy Industries, Ltd. and Mitsubishi Heavy Industries America, Inc.

Determination), August 5, 1993 (Commission Opinion).

1. *Modine Manufacturing Co. v. United States Int'l Trade Comm'n*, Inv. No. 337-TA-334, April 23, 1993 (Initial Determination), July 23, 1993 (Final

The issues on appeal are the validity and enforceability of Modine's United States Patent No. 4,998,580 (the '580 patent) and infringement by several models of condensers manufactured by Showa and imported, sold, and used by the intervenors. Modine is the appellant on the infringement issues, and the intervenors appeal the issues of validity and enforceability. We vacate the finding of non-infringement and remand for further proceedings based on the correct claim interpretation. On the other issues the Commission's decision is affirmed.

I

THE PATENTED INVENTION

The invention of the '580 patent is described by Modine as a highly efficient and environmentally advanced condenser for use in automotive air conditioning. It is more compact, lighter, uses less refrigerant, outperforms prior condensers, and has the additional advantage of being usable with refrigerants other than chlorofluorocarbons. Modine states that it converted the entire industry to a new standard.

Claims 9 and 10 of the '580 patent, the only claims in suit, are shown with emphasis added to point out the two terms that are the focus of the infringement issues:

Claim 9. A condenser for a refrigerant in a cooling system comprising:

- [1] a pair of spaced, generally parallel, elongated cylindrical tubes defining headers;
- [2] a vapor inlet in one of said tubes;
- [3] a condensate outlet from one of said tubes;
- [4] said header tubes each having a series of elongated generally parallel slots with the slots in the series on one header tube aligned with and facing the slots in the series on the other header tube;
- [5] a tube row defined by a plurality of straight, tubes of flat cross-section and with *flat side walls* and having opposed ends extending in parallel between said header tubes, the ends of said flat cross-section tubes being disposed in corresponding aligned ones of said slots and in fluid communication with the interior of

said header tubes, at least some of said tubes being in hydraulic parallel with each other;

[6] web means within said flat cross-section tubes and extending between and joined to the flat side walls at spaced intervals to (a) define a plurality of discrete, hydraulically parallel flow paths within each flat cross-section tube that extend between said header tubes; to (b) absorb forces resulting from internal pressure within said condenser and tending to expand the flat cross-section tubes; and to (c) conduct heat between both said flat sides and fluid in said flow paths;

[7] said flow paths being of *relatively small hydraulic diameter* which is defined as the cross-sectional area of the corresponding flow path multiplied by four (4) and divided by the wetted perimeter of the corresponding flow path;

[8] serpentine fins incapable of supporting said flat cross-section tubes against substantial internal pressure extending between facing flat side walls of adjacent flat cross-section tubes;

[9] each of said flow paths including at least one elongated crevice extending generally along the length of the associated flow path.

Claim 10. The condenser of claim 9 wherein each flow path has a plurality of said crevices.

It is not disputed that all of the elements of the claimed invention have counterparts in the accused condensers, and that infringement turns on the meaning and scope of the terms "flat side walls" and "relatively small hydraulic diameter." Modine challenges the correctness of the Commission's claim interpretation and the ensuing finding of non-infringement.

II

INFRINGEMENT

[1] As we have recently held, "[b]ecause claim construction is a matter of law, the construction given the claims is reviewed *de novo* on appeal." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979, 34 USPQ2d 1321, 1329 (Fed.Cir.) (*en banc*), cert. grant-

ed. — U.S. —, 116 S.Ct. 40, 132 L.Ed.2d 921 (1995). Disputes as to the meaning and scope of terms as used in the claims are determined as a matter of law, based on the patent specification and the prosecution history if it is in evidence. *Id.* at 979-80, 34 USPQ2d at 1329-30. As stated in *Markman*, "[w]hen legal 'experts' offer their conflicting views of how the patent should be construed, or where the legal expert's view of how the patent should be construed conflicts with the patent document itself, such conflict does not create a question of fact nor can the expert opinion bind the court or relieve the court of its obligation to construe the claims according to the tenor of the patent. This opinion testimony also does not change or affect the *de novo* appellate review standard for ascertaining the meaning of the claim language." *Id.* at 983, 34 USPQ2d at 1333.

A. THE FLAT SIDE WALLS

[2] The Commission, adopting the ALJ's Initial Determination, held that the term "flat side walls" means the interior walls of the condenser tubes, and that although the Showa side walls are flat in that they are not rounded, they are not "flat" because most (but not all) of the Showa models have fin-like projections on their interior surfaces. On this term construction the Commission concluded that the Showa tubes do not have "flat side walls" and therefore that the claims are not infringed by any of the Showa models.

Modine states that "flat side walls" describes the shape of the tubes, and refers to the '580 specification which describes the condenser tubes as "noncircular in cross section" and as a "flattened tube." Modine states that the side walls are flat whether or not they have fins on their inner surfaces, pointing out that the specification as well as the claims show fins on the outer surfaces as well as webs on the inner surfaces. Claim 9 mentions "flat side walls" in several clauses:

[5] a plurality of straight tubes of flat cross-section and with flat side walls ...

[6] web means within said flat cross-section tubes and extending between and joined to the flat side walls ...

* * * * *

[8] serpentine fins incapable of supporting said flat cross-section tubes against substantial internal pressure extending between facing flat side walls of adjacent flat cross-section tubes;

Clause [5] uses the word "flat" to describe both the cross-section and the side walls, but neither usage of "flat" requires that the interior or exterior wall surfaces be clear, without web or fin. Clause [6] requires a web "joined to" the interior flat side walls, negating the ALJ's reading that the wall surfaces must be clear. Clause [8] describes serpentine fins on flat side walls that are necessarily the exterior surfaces of the walls, contravening the ALJ's ruling that "flat side walls" means the interior walls.

The entirety of the claim's usage of flat side walls is consistent with the specification's description of the condenser tubes as "flattened" and "not circular." This plain reading is not affected by webs or fins on either the interior or the exterior surfaces of the walls, or by the crevices of claim 10. Indeed, a claim interpretation that would exclude the inventor's device is rarely the correct interpretation; such an interpretation requires highly persuasive evidentiary support, whereas in this case it received none, whether from the specification, the prosecution history, or the prior art.

We conclude that the term "flat side walls" means that the tube structure is flat, as the specification states, and does not prohibit the presence of fins, webs, or other attachments to either the interior or exterior surfaces. Those Showa tubes that bear inner fins (the 3mm models), and those that do not (the 2mm models), all have flat side walls as the term is correctly construed. This claim limitation is not a ground for a finding of noninfringement.

B. RELATIVELY SMALL HYDRAULIC DIAMETER

The Commission held that the claim term "relatively small hydraulic diameter" is a limitation to hydraulic diameters no larger than exactly 0.040 inch. Since the hydraulic diameters of the Showa condensers are all larger than 0.040 inch, the Commission held that

the claims are not infringed, literally or under the doctrine of equivalents.

Hydraulic diameter is an engineering designation that measures the flow path within the condenser. It is defined as the cross-sectional area of the corresponding flow path multiplied by four and divided by the wetted perimeter of the corresponding flow path; this definition is included in claim clause [7]. Claims 9 and 10, the claims in suit, describe the hydraulic diameter as "relatively small." Claims not in suit describe the hydraulic diameter as "about 0.015 to 0.040 inches" (claims 1-3), "in the range of 0.015 to 0.040 inches" (claims 4-5), and "sufficiently small ... so that surface tension and capillary forces acting upon condensate within said flow paths improve heat transfer efficiency" (claims 6-8). The Commission held that "relatively small" in claims 9 and 10 has an upper limit of 0.040 inch.

[3-5] Ordinarily a claim element that is claimed in general descriptive words, when a numerical range appears in the specification and in other claims, is not limited to the numbers in the specification or the other claims. See *Specialty Composites v. Cabot Corp.*, 845 F.2d 981, 987, 6 USPQ2d 1601, 1604 (Fed.Cir.1988) ("[P]articular embodiments appearing in the specification will not generally be read into the claims.... What is patented is not restricted to the examples, but is defined by the words in the claims.") It is usually incorrect to read numerical precision into a claim from which it is absent, particularly when other claims contain the numerical limitation. In *D.M.I., Inc. v. Deere & Co.*, 755 F.2d 1570, 1574, 225 USPQ 236, 239 (Fed.Cir.1985), the court stated:

Where, as here, the limitation sought to be "read into" a claim already appears in another claim, the rule is far more than "general." It is fixed. It is long and well established. It enjoys an immutable and universally applicable status comparatively rare among rules of law. Without it, the entire statutory and regulatory structure governing the drafting, submission, examination, allowance, and enforceability of claims would crumble.

When a limitation is included in several claims but is stated in terms of apparently

different scope, there is a presumption that a difference in scope is intended and is real. *Tandon Corp. v. United States Int'l Trade Comm'n*, 831 F.2d 1017, 1023, 4 USPQ2d 1283, 1288 (Fed.Cir.1987). Such a presumption can be overcome, but the evidence must be clear and persuasive. Conversely, it is incorrect to construe a claim as encompassing the scope that was relinquished in order to obtain allowance of another claim, despite a difference in the words used. See *Builders Concrete, Inc. v. Bremerton Concrete Prods. Co.*, 757 F.2d 255, 260, 225 USPQ 240, 243 (Fed.Cir.1985).

[6] All rules of construction must be understood in terms of the factual situations that produced them, and applied in fidelity to their origins. Thus, although Modine stresses the rule that the description of the preferred embodiment in the specification does not limit the claims to that embodiment, when the preferred embodiment is described in the specification as the invention itself, the claims are not necessarily entitled to a scope broader than that embodiment. See *Autogiro Co. of America v. United States*, 884 F.2d 891, 898, 181 Ct.Cl. 55, 155 USPQ 697, 708 (1987) ("where the patentee describes an embodiment as being the invention itself and not only one way of utilizing it," this description guides understanding the scope of the claims).

[7] Modine accurately states that the '580 specification describes "about 0.015-0.040 inch" as the "preferred embodiment." However, it is the only embodiment remaining for, as we shall discuss, the broader range of 0.015-0.070 inch was removed from the specification on refile of the patent application. Modine thus limited the invention of the '580 patent to hydraulic diameters in the range of about 0.015-0.040 inch. Although Modine states that it neither abandoned, nor intended to abandon, the broader range of hydraulic diameters, and is prosecuting in another application claims that include hydraulic diameters up to 0.07 inch, that does not control the construction of the claims of the '580 patent.

Thus we agree with the Commission that "relatively small" in claims 9 and 10, inter-

preted in light of the '580 specification and the prosecution history, is not entitled to the range of up to 0.070 inch as sought by Modine. However, the Commission erred in literally restricting the hydraulic diameter range to an upper limit of exactly 0.040 inch, and in barring access to the doctrine of equivalents. See *Hilton Davis Chem. Co. v. Warner-Jenkinson Co.*, 62 F.3d 1512, 1522, 35 USPQ2d 1641, 1648 (Fed.Cir.1995) (*en banc*) ("The trial judge does not have discretion to choose whether to apply the doctrine of equivalents when the record shows no literal infringement.")

1. The Specification and the Prosecution History

The '580 patent evolved from two continuation-in-part applications. The first-filed application, called the "grandparent," described condenser tubes with flow paths having hydraulic diameters in the range of "about 0.015-0.070" inch. The specification stated that "heat transfer is increased in the range of hydraulic diameters of about 0.015 inches to about 0.070 inches through the use of the invention with some variance depending upon air flow." The specification also stated that the preferred range was "about 0.015-0.040" inch. The specification included a graph of heat transfer as a function of hydraulic diameter, and described the graph as showing improved performance at hydraulic diameters up to about 0.070 inch.

In the second-filed application, called the "parent," the hydraulic diameter upper limit of "about 0.070" inch in the grandparent was replaced, at every occurrence in the text, with "about 0.040" inch. The graph showing improved performance at hydraulic diameters up to 0.070 inch was retained in the application, but the explanatory text now described the graph as showing that

heat transfer is advantageously and substantially increased in the range of hydraulic diameters of about 0.015 inches to about 0.040 inches through the use of the invention with some variance depending upon air flow.

In the ensuing prosecution, when the examiner objected that the specification did not show "criticality" of the 0.015-0.040 inch

range, Modine argued that this was the peak range "and it is this peak heat range that is sought to be covered by the applicant." During prosecution of the parent application Modine told the patent examiner of the "Cat-Folded Front" condenser that was made by Modine for the Caterpillar Company for use in tractors, and sold more than a year before the filing date of the grandparent application. The Cat condenser had several structural differences from the condenser described in these applications: it had an overall hydraulic diameter of 0.0496 inch (or 0.04822, the record shows both figures); it did not have a web joined to the tube walls; and it did not have a plurality of elongated crevices in the flow paths. The Cat condenser was treated as prior art, along with several cited references.

Modine again refiled the patent application (the "child" application), without further change in the description of the hydraulic diameter. Although Modine points out that hydraulic diameters up to 0.070 inch continued to be shown in the graph that appeared in all three applications, the replacement of 0.070 with 0.040 in the text requires the conclusion that the applicant limited the invention described in the refiled applications to hydraulic diameters of up to about 0.040 inch.

[8] Modine argues that the limitation in the parent/child specifications to hydraulic diameters of about 0.015-0.040 inch was not required by the prior art, pointing out that it is appropriate to consider not only the changes made during prosecution but also the reason for the changes. See *Insta-Foam Prods., Inc. v. Universal Foam Sys., Inc.*, 906 F.2d 698, 703, 15 USPQ2d 1295, 1298 (Fed.Cir.1990) ("A close examination must be made as to not only what was surrendered, but also the reason for such a surrender.") Although Modine may be correct that it was not necessary to reduce 0.070 to 0.040, this change was conspicuous and unambiguous. It was made in the context of the cited references and the Cat condenser, and the interested public is entitled to rely on it in interpreting the claim term "relatively small" as used in the '580 patent.

2. The Incorporation by Reference

[9] The '580 specification incorporates by reference a patent entitled "Method of Making a Heat Exchanger," U.S. Patent No. 4,688,311 (the '311 patent). The '580 specification states that the '311 patent describes a "highly preferred means by which the tubes 20 with accompanying spacers 40 may be formed." Modine places great weight on this incorporation to support its position that "relatively small" is correctly construed to mean hydraulic diameters up to 0.07 inch, for the '311 patent states:

The invention may be used with particular efficacy where the flow passages are to be of relatively small hydraulic diameter as, for example, 0.07 inches or less. When such dimension is selected, particularly where the hydraulic diameter is 0.040 inches or less, the structure is ideal for utilization in a high efficiency condenser.

Modine stresses that the '311 patent defines "relatively small" as "0.07 inch or less," and that incorporation by reference has the same effect as if the host patent had set forth the entire text of the incorporated document. See *In re Lund*, 376 F.2d 982, 989, 153 USPQ 625, 631 (C.C.P.A.1967).

However, incorporation by reference does not convert the invention of the incorporated patent into the invention of the host patent. The use of "relatively small" to describe the condenser flow paths to which the '311 manufacturing method is applicable did not restate into the parent and the child applications the hydraulic diameter range that was deleted from the grandparent. The words "relatively small" appear only once in the '580 specification, and do not change the presentation of the invention as defined by the hydraulic diameter numerical range stated throughout the specification:

In addition to the utilization of a relatively small hydraulic diameter for the flow paths as mentioned previously, as another facet of the invention, it is contemplated that each of the flow paths have at least one crevice preferably extending along the entire length of the flow path, ...

"Relatively small" does not appear to have an independent meaning in this art that would distinguish between 0.040 and 0.070 inch. In

view of the replacement of the "relatively small" parameter of about 0.070 in the grandparent application with the "relatively small" parameter of about 0.040 in the parent and child applications, it does not appear to be correct to read the scope of "relatively small" in the '311 patent as overriding that replacement.

3. The Prosecution of Claims 9 and 10 (Application Claims 27 and 28)

The claims in suit were added near the end of the prosecution of the child application, and contain the only usage of "relatively small" in the claims. During prosecution Modine cancelled allowed claim 10 and added application claims 25-28. Modine points out that when application claims 25-28 were added Modine told the examiner that the claims were broader than allowed application claim 10 in some respects and narrower in others:

New Claim 25 is somewhat like original Claim 10 although it is broader in some respects and narrower in others.

As regards new Claims 25-28, independent Claim 25 is basically directed to the improved strength characteristic of the invention. See page 7 of the application as filed. Should the Examiner believe it to be dispositive, or otherwise helpful in determining the patentability of these claims, counsel notes that when the hoop strength containment feature of the Cat folded front type tubes is removed by removing the plate fins at the rounds of the flattened tubes, that is, at the radius of the flattened tubes, deformation and/or bursts occur at about 1,800 PSI; whereas the tubes of the present invention remained intact at pressures at least as high as 2,000 PSI. These sort of results are believed to commend the patentability of independent Claim 25.

Thus in presenting this group of claims Modine focused on the additional strength assertedly provided by the web means, not that these claims broadened the scope of the hydraulic diameter. Independent claim 25 used the words "relatively small hydraulic diameter." Showa argues, and we agree, that the examiner viewed all the claims as referring to the hydraulic diameter range of 0.015 to

0.04, for the examiner stated at one point during the prosecution of this claim:

Therefore, to achieve increased heat transfer and to save on material consumption it would have been obvious to one of ordinary skill in the art of heat exchange to reduce the hydraulic diameter of flow passages to within the claimed range of 0.015 to 0.04 as taught by Asselman et al. The examiner persisted in the rejection of application claims 25 and 26, but held that claims 27 and 28 were allowable. In view of the prosecution history, we conclude that "relatively small" in application claims 27 and 28 (patent claims 9 and 10) did not enlarge the range of hydraulic diameters beyond that described in the specification as the invention.

The specification and prosecution history of the '580 patent do not permit a construction of "relatively small" to include the 0.070 inch range that was described in the grandparent application, when that range was reduced in the parent and child to about 0.040 inch. However, neither are the claims correctly construed as limited to exactly 0.040 inch. Although the Commission correctly held that "relatively small" in claims 9 and 10 is limited by the description of the invention in the specification, the Commission incorrectly limited the hydraulic diameter to exactly 0.040 inch, for that is not the description in the specification and is not required by the prosecution history.

[10] The specification uses the qualifier "about," and also states that the optimum hydraulic diameter varies with the conditions. Such broadening usages as "about" must be given reasonable scope; they must be viewed by the decisionmaker as they would be understood by persons experienced in the field of the invention. *Andrew Corp. v. Gabriel Electronics, Inc.*, 847 F.2d 819, 821-22, 6 USPQ2d 2010, 2013 (Fed.Cir.), cert. denied, 488 U.S. 927, 109 S.Ct. 812, 102 L.Ed.2d 330 (1988). Although it is rarely feasible to attach a precise limit to "about," the usage can usually be understood in light of the technology embodied in the invention. When the claims are applied to an accused device, it is a question of technologic fact whether the accused device meets a reason-

able meaning of "about" in the particular circumstances. Thus we turn to the factual aspects of the infringement determination.

C. LITERAL INFRINGEMENT

The record shows hydraulic diameter ranges of the nine Showa models before the Commission as follows: 0.0484-0.0619 inch; 0.0453-0.0520 inch; 0.0477-0.0577 inch; 0.0577-0.0606 inch; 0.0482-0.0497 inch; 0.061-0.065 inch; 0.0445-0.0682 inch; 0.0424-0.0573 inch; and 0.0513-0.0547 inch. The ALJ also referred to a model having a range of 0.0453-0.0477 inch. The Commission, incorrectly limiting "relatively small" to precisely 0.040 inch, did not consider variability based on the nature of the coolant, as stated in the specification, and did not determine whether any of the Showa models were within a reasonable literal scope of "relatively small" interpreted as meaning "about 0.015-0.040" inch.

Precedent illustrates the fact-dependency of determinations of the technologic scope of "about" and similar terms, depending on their contexts and the precision or significance of the measurements used. See, e.g., *Quantum Corp. v. Rodime, PLC*, 65 F.3d 1577, 36 USPQ2d 1162 (Fed.Cir.1995) (the addition of "approximately" during reexamination was a significant broadening of the claims); *Hybritech, Inc. v. Abbott Labs.*, 849 F.2d 1446, 1455, 7 USPQ2d 1191, 1199 (Fed. Cir.1988) ("at least about 10^8 liters/mole" is literally satisfied by 4.8×10^7 liters/mole and 7.1 to 7.5×10^7 liters/mole); *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 842 F.2d 1275, 1280, 6 USPQ2d 1277, 1282 (Fed.Cir.1988) (an "imprecise limitation, such as the phrase 'about 100% per second' is to be considered in determination of infringement); *Rosemount, Inc. v. Beckman Instruments, Inc.*, 727 F.2d 1540, 1546-47, 221 USPQ 1, 7 (Fed. Cir.1984) ("close proximity" is as precise as the subject matter permits").

The Commission's determination of literal infringement was based on a hydraulic diameter limit of exactly 0.040 inch, with no consideration of the scope of "about" and no determination of the effect of relevant factors such as the nature of the coolant and the

precision of measurement. The finding of non-infringement was based on an incorrect claim construction, leading to an inadequate application of the claims to the accused devices. The finding is vacated. On remand the Commission shall determine whether any of the accused condenser models literally infringes the claims, upon construction of the claim term "relatively small" as meaning a hydraulic diameter in the range of about 0.015-0.040 inch, and upon applying the claims to the various accused Showa models.

D. INFRINGEMENT BY EQUIVALENCY

[11] The Commission held that the doctrine of equivalents did not apply because Showa did not "unscrupulously" copy the Modine condenser. This ruling was based on an incorrect view of the law. As was explained in *Hilton Davis*, 62 F.3d at 1522, 35 USPQ2d at 1648, there is no equitable threshold for determination of the factual question of infringement by equivalency. Although the ALJ received evidence on the facts relevant to equivalency, the findings were made in the context of an incorrect view of prosecution history estoppel, the ALJ holding that Modine's claims were limited to hydraulic diameters no larger than exactly 0.040 inch. The ALJ's determination of estoppel was based on the same factors that led to the incorrect claim interpretation.

Modine argued to the Commission that the teachings in the specification, including the graph showing superior coolant activity up to a hydraulic diameter of 0.070 inch, support a range of equivalents up to 0.070 inch. Modine alternatively argued that even if the Commission found that Modine was not entitled to this range of equivalents, it is entitled to establish equivalency up to the overall hydraulic diameter of the prior art Cat condenser, i.e. about 0.48-0.49 inch.

[12] Discussing the imported accused condensers, the ALJ found as fact that their function and result are the same as those of the claimed invention, but that the imported condensers do not meet the "same way" test because of the presence of internal fins in some of the Showa models. However, Modine's evidence was substantially un rebutted

that the presence of inner fins did not substantially change the way the condensers function, by surface tension and capillary forces. Although the intervenors argue that their condensers with larger hydraulic diameters are less efficient, equal performance is not required to establish equivalency. *Laitram Corp. v. Cambridge Wire Cloth Co.*, 863 F.2d 855, 859, 9 USPQ2d 1289, 1294 (Fed. Cir.1988), cert. denied, 490 U.S. 1068, 109 S.Ct. 2069, 104 L.Ed.2d 634 (1989). The ALJ's finding is against the heavy weight of the evidence. There was not substantial evidence supporting the finding of non-equivalence.

[13, 14] However, the ALJ correctly recognized that prosecution history estoppel limits the application of the doctrine of equivalents, even when the function/way/result or other test of equivalency is met by the accused devices. Prosecution history estoppel implements the principle that a patentee can not obtain, in an infringement suit, protection of subject matter that was relinquished in order to obtain allowance of other subject matter during prosecution of the patent application. *Mannesmann Demag Corp. v. Engineered Metal Prods. Co.*, 793 F.2d 1279, 1285, 230 USPQ 45, 48 (Fed.Cir.1986) (the relinquished subject matter must be material to the issuance of the patent). The standard for determining whether particular subject matter was relinquished and was material is an objective one which we determine as a matter of law, *LaBounty Mfg., Inc. v. United States Int'l Trade Comm'n*, 867 F.2d 1572, 1576, 9 USPQ2d 1995, 1998 (Fed.Cir.1989), and is based on the reasonable reading, by a person of skill in the field of the invention, of the entire prosecution history.

[15] We have discussed the prosecution history *ante*, and concluded that in connection with the patent application that led to the '580 patent, Modine relinquished the range of hydraulic diameters that extended to 0.070 inch, based in substantial part on the hydraulic diameter of the prior art Cat-Folded Front condenser. Although Modine points out that the '580 invention differs in several respects from the Cat condenser, the prosecution history shows that the hydraulic

diameter of the Cat condenser was a factor in limitation of the '580 claims. The change in the description of the hydraulic diameter in the specification from grandparent to parent/child application, and the arguments to the patent examiner, highlighted the applicant's action in distinguishing the '580 claims from the Cat condenser.

Thus we conclude that the available range of equivalency is limited, by estoppel, to the hydraulic diameter of the Cat condenser. Within this boundary, however, the prosecution history and the prior art do not eliminate equivalents if substantial identity is shown. The controlling criterion, as reaffirmed in *Hilton Davis*, 62 F.3d at 1518, 35 USPQ2d at 1645, is whether the accused device is substantially the same as the claimed invention. See *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 606, 607, 70 S.Ct. 854, 855-56, 94 L.Ed. 1097 (1950) (insubstantial changes do not avoid the application of the doctrine of equivalents).

The ALJ incorrectly held that Modine was estopped to assert equivalency against any condenser with a hydraulic diameter larger than exactly 0.040 inch. The holding is vacated, and the case is remanded to the Commission for findings in accordance with the doctrine of equivalents.

III

VALIDITY AND ENFORCEABILITY

The Commission held that the '580 patent was valid and enforceable. The intervenors appeal these holdings, stating that there is an on-sale bar, that the claims are invalid for obviousness or indefiniteness, and that Modine committed inequitable conduct in its prosecution of the '580 patent.

A. Prior Sale, 35 U.S.C. § 102(b)

[16, 17] If Modine is entitled to the filing date of its grandparent or parent application, 35 U.S.C. § 120, the parties agree that there is no on-sale bar based on Modine's own

2. Although the substantive aspects are mooted by our affirmance with respect to this issue, we have considered Modine's appeal of a discovery-related decision, to the following extent. Modine complains that the ALJ refused to reopen the

sales of the claimed condenser. The Commission found that the two-pass condenser, as it was described in various documents, was described as well as enabled in the parent application. Although Mitsubishi argues that the claims of the parent application did not describe a two-pass condenser, the Commission found, and we agree, that the disclosure was present in the specification. A later application is entitled to the earlier filing date for all common subject matter that is contained in the earlier application, whether the subject matter appears in the body of the specification or in the claims or drawings.

The Commission found that the parent application adequately described, in compliance with 35 U.S.C. § 112 ¶1, the subject matter that is now claimed. See *Ralston Purina Co. v. Far-Mar-Co. Inc.*, 772 F.2d 1570, 1574, 227 USPQ 177, 178 (Fed.Cir.1985). The Commission's findings are supported by substantial evidence. The determination that there is not an on-sale bar is affirmed.

B. Obviousness, 35 U.S.C. § 103

[18] The Commission held that invalidity based on obviousness had not been established, in that there was no teaching or suggestion that prior art condensers should be modified in the several ways that are embodied in the '580 invention. The Commission appropriately considered the superior results achieved, the long-felt need for an automotive condenser that would overcome the limitations in cooling capacity and coolant nature that had been reached by conventional automotive condensers, and the commercial success of the '580 invention. The Commission observed that reduction of hydraulic diameter had previously been associated with an undesirable increase in refrigerant-side pressure drop, and that Modine's result was unexpected as well as superior.

Reversible error has not been shown in the Commission's determination that the patent is not invalid on the ground of obviousness. The decision is affirmed.²

record to receive newly discovered evidence relevant to the issue of obviousness. Modine states that this evidence was within the clear scope of the agreed discovery, was highly relevant to Sho-

C. Indefiniteness, 35 U.S.C. § 112

The intervenors argue that the claims are invalid for indefiniteness if "relatively small" is construed as larger than exactly 0.040 inch. The ALJ had adopted this position. However, as we have discussed *ante*, technical terms are not *per se* indefinite when expressed in qualitative terms without numerical limits.

[19-21] When claims are amenable to more than one construction, they should when reasonably possible be interpreted so as to preserve their validity. *Whittaker Corp. by its Technibilt Div. v. UNR Indus., Inc.*, 911 F.2d 709, 711, 15 USPQ2d 1742, 1744 (Fed.Cir.1990); *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577, 221 USPQ 929, 932 (Fed.Cir.1984). In this case the specification itself used the terms "relatively small," and "about 0.015-0.040," and the construction required to preserve the claims' validity was simply that "relatively small" and "about 0.015-0.040" not include invalidating prior art. It was evident from the prosecution history that the patentability of claims 9 and 10 did not require an exact numerical limit of the hydraulic diameter. Mathematical precision should not be imposed for its own sake; a patentee has the right to claim the invention in terms that would be understood by persons of skill in the field of the invention. See *Shatterproof Glass Corp. v. Libbey-Owens Ford Co.*, 758 F.2d 613, 624, 225 USPQ 634, 641 (Fed.Cir.), *cert. dismissed*, 474 U.S. 976, 106 S.Ct. 340, 88 L.Ed.2d 326 (1985) ("if the language is as precise as the subject matter permits, the courts can demand no more").

Thus although we do not endorse the Commission's reason, the Commission's holding that the claims are not invalid for indefiniteness is affirmed.

wa's challenge to validity, and was deliberately withheld.

The issue is not, as the Commission and the intervenors state, whether the ALJ had discretion to refuse to open the record because of the imminent deadline for filing the Initial Determination. The issue is whether the Commission should ignore an asserted noncompliance with agreed

D. Inequitable Conduct

[22] The Commission held that the '580 patent was not unenforceable for inequitable conduct, finding that there was no withholding of material information with intent to deceive or mislead the patent examiner into granting the patent. Both materiality and intent are essential factual predicates of inequitable conduct, and each must be proved by clear and convincing evidence. *Kingsdown Medical Consultants, Ltd. v. Hollister Inc.*, 863 F.2d 867, 9 USPQ2d 1384 (Fed.Cir.1988) (*en banc*), *cert. denied*, 490 U.S. 1067, 109 S.Ct. 2068, 104 L.Ed.2d 633 (1989).

[23] The ALJ had criticized Modine's choice of the data that were included in the grandparent application as filed, for Modine had replaced a graph of computer-generated heat transfer data, that appeared in an early draft of the patent application, with later-obtained data and comparison with a different prior art condenser. Modine explained at trial the flaws in the first set of data, and the reasons for the change to data that were believed to be more accurate and to present a more useful comparison. Although there was no challenge at trial to either the correctness or the veracity of this explanation, the ALJ nonetheless found that Modine intended to deceive the patent examiner. The ALJ also criticized Modine's description of the prior art and the arguments presented to the examiner concerning the prior art.

The Commission found that comparative data with Modine's most efficient prior condenser were included in graphs in the patent application, and that certain computer-generated early data were replaced with more accurate data. Substantial evidence supports the Commission's findings that there was neither material withholding nor intent to deceive in Modine's selection of data and in the prosecution of the patent application. We remark that the rule of *Kingsdown* evolved in response to the "plague" of collat-

discovery. The Commission's statutory deadlines place a special responsibility not only on the parties, but on the Commission. Should a party withhold with impunity clearly relevant information that had been reasonably requested, the integrity and value of the ensuing Commission decision is jeopardized.

eral attacks, of which this is an example, wherein routine patent practice is challenged without substance. See *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 939, 15 USPQ2d 1321, 1327 (Fed.Cir.1990).

The holding that there was not inequitable conduct is affirmed.

Summary

Having interpreted the claims *de novo*, we vacate the Commission's rulings on the issues of infringement, and remand for findings and redetermination with respect to literal infringement and infringement under the doctrine of equivalents. In all other respects the Commission's decision is affirmed.

AFFIRMED IN PART, VACATED IN PART, AND REMANDED

MAYER, C.J., dissents.



PPG INDUSTRIES, INC.,
Plaintiff-Appellee,
v.
GUARDIAN INDUSTRIES
CORPORATION, Defendant-Appellant.
No. 95-1222.

United States Court of Appeals,
Federal Circuit.

Feb. 6, 1996.

Patentee brought infringement action against competitor, alleging infringement of its patent for automotive solar control glass. The United States District Court for the Western District of Pennsylvania, Gary L. Lancaster, J., entered preliminary injunction in favor of patentee, and competitor appealed. The Court of Appeals, Bryson, Circuit Judge, held that: (1) competitor's automotive solar control glass, which filtered ultraviolet infrared radiation, could infringe patented

glass, even if inventor's use of flawed testing equipment led to belief that glass having composition of competitor's glass would not satisfy patent's 31% ultraviolet transmission requirement; (2) inventors' mistaken belief at time they applied for patent for solar control glass that competitor's glass could not meet transmittance limitations in patent claims did not establish that patent claims did not accurately and distinctly set out what inventors regarded as their invention; (3) patent satisfied statutory enablement requirement; (4) sulfur content in competitor's automotive solar control glass, which was not required contained in patent, did not establish that competitor's glass was not infringing; (5) patent was not invalid on grounds of obviousness or anticipation; (6) patentee's showing that it was likely to prevail on issues of patent validity and infringement entitled it to presumption of irreparable harm necessary for preliminary injunctive relief; and (7) balance of hardships and public interest favored grant of injunctive relief.

Affirmed.

1. Patents \Rightarrow 226.8, 227

Competitor's automotive solar control glass, which filtered ultraviolet and infrared radiation, could infringe patented glass, even if inventor's use of flawed testing equipment led to belief that glass having composition of competitor's glass would not satisfy patent's 31% ultraviolet transmission requirement; competitor's glass fell within patent claims regarding composition of glass and total solar energy transmission.

2. Patents \Rightarrow 101(6)

Requirement for precision and definiteness in patent claim language requires patent claims to make it clear what subject matter they encompass. 35 U.S.C.A. \S 112.

3. Patents \Rightarrow 101(6)

Claims in patent for automotive solar control glass, designed to filter out sun's ultraviolet and infrared radiation, were not invalid for indefiniteness; claims precisely quantified essential ingredients and transmittance tolerances of claimed compositions and

income tax refund suit." ⁸ Elsewhere, the Court refers to "the portion of appellee's 1976 income tax liability attributable to the minimum tax imposed by § 56 of the Code on items of tax preference as defined in § 57." 449 U.S. at 294, 101 S.Ct. at 550. Were this a "close" case, which we do not believe is so, the Court's dicta would carry the day.

[1,2] In view of the foregoing, we hold that the minimum tax is an income tax and not an excise tax deductible under sections 162 or 212 of the Internal Revenue Code.

Accordingly, the Claims Court's order was not erroneous and is *affirmed*.

AFFIRMED.



In re MERCK & CO., INC.

No. 85-2740.

United States Court of Appeals,
Federal Circuit.

Sept. 8, 1986.

Assignee of patent involving claimed invention of method of treating human depression by oral administration of amitriptyline requested reexamination of patent. The Patent and Trademark Office Board of Patent Appeals and Interferences sustained rejection of pertinent claims in the reexamination application, and assignee appealed. The Court of Appeals, Davis, Circuit Judge, held that: (1) claimed invention was *prima facie* obvious, and (2) alleged unexpected effects did not rebut finding of *prima facie* obviousness.

Affirmed.

Baldwin, Circuit Judge, filed dissenting opinion.

8. We note that in their STATEMENT OF THE CASE appellants, similarly to the Supreme

1. Patents ¶16.25

Claimed invention of method of treating human depression by oral administration of amitriptyline was *prima facie* obvious over prior art or record, given its structural similarity to imipramine, already used in treatment of depression; one of ordinary skill in medicinal chemical arts would have expected amitriptyline to resemble imipramine in alleviation of depression. 35 U.S.C.A. § 103.

2. Patents ¶16(3)

Test for determining whether claimed invention of method of treating human depression by oral administration of amitriptyline was obvious was whether references, taken as whole, would have suggested invention to one of ordinary skill in medicinal chemical arts at time invention was made, rather than "obvious to try" standard. 35 U.S.C.A. § 103.

3. Patents ¶16.25

Prior art teaching that precise structural differences between amitriptyline and imipramine involved known bioisosteric replacement, in combination with teachings that the drugs were closely structurally related and that one would expect similar structures to behave similarly, provided sufficient basis for required expectation of success, in determining that claimed invention of method of treating human depression by oral administration of amitriptyline was obvious, without resort to hindsight, where imipramine was already useful in treatment of depression. 35 U.S.C.A. § 103.

4. Patents ¶16(1)

Obviousness, as basis for unpatentability, does not require absolute predictability; only reasonable expectation that beneficial result will be achieved is necessary to show obviousness. 35 U.S.C.A. § 103.

5. Patents ¶16(2)

Nonobviousness, necessary for patentability, cannot be established by attacking

Court in *Darusmont*, recite that this case "involves a suit for refund of income taxes."

references individually, where rejection is based upon teachings of combination of references. 35 U.S.C.A. § 103.

6. Patents ⇐34

Evidence of contemporaneous invention, in determining patentability of claimed invention of method of treating human depression by oral administration of amitriptyline, although unnecessary, was probative of level of knowledge in art and time invention was made, in determining whether claimed invention was obvious. 35 U.S.C.A. § 103.

7. Patents ⇐36(1)

Prima facie case of obviousness can be rebutted by evidence of unexpected result, in determining invention's patentability. 35 U.S.C.A. § 103.

8. Patents ⇐36(1)

Alleged unexpected properties of amitriptyline, that it had more potent sedative and stronger anticholinergic effect, were not so unexpectedly different from properties of imipramine, closest prior art, as to overcome prima facie showing of obviousness of claimed invention of method of treating human depression by oral administration of amitriptyline. 35 U.S.C.A. § 103.

Charles M. Caruso of Merck & Co., Inc., Rahway, N.J., argued for appellant. With him on brief was Nels T. Lippert, of Fitzpatrick, Cella, Harper & Scinto, New York City. Of counsel were Mario A. Monaco and Michael C. Sudol, Jr., of Merck & Co., Inc., Rahway, N.J.

Richard E. Schafer, Associate Sol., Office of Sol., Arlington, Va., argued for appellee. With him on brief were Joseph F. Nakamura, Sol., and Fred E. McKelvey, Deputy Sol.

1. *Ex Parte Merck and Co.*, Reexamination No. 90/000264, Appeal No. 607-66 (PTO Bd.Pat.App. & Int., May 28, 1985), JA p. 7. In its opinion the Board expressly adopted the reasonings in its earlier reissue (for the '735 patent) opinions, *Ex Parte Edward L. Engelhardt*, Reissue Application No. 776,464, Appeal No. 424-40 (PTO Bd. Pat.App., Apr. 23, 1980), JA p. 13 and *Ex Parte Edward L. Engelhardt*, Reissue Application No.

Donald R. Dunner of Finnegan, Henderson, Farabow, Garrett & Dunner, Washington, D.C., argued for intervenor Biocraft Laboratories, Inc. With him on brief were Robert D. Bajefsky and Carol P. Einaudi of Finnegan, Henderson, Farabow, Garrett & Dunner, Washington, D.C. Of counsel was Beryl L. Snyder, of Biocraft Laboratories, Inc., Elmwood Park, N.J.

Before DAVIS, BALDWIN and ARCHER, Circuit Judges.

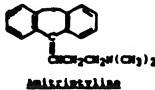
DAVIS, Circuit Judge.

This is an appeal from a final decision of the United States Patent and Trademark Office (PTO) Board of Patent Appeals and Interferences (Board), sustaining the rejection of claims 1 through 3 in the reexamination application¹ of U.S. Patent No. 3,428,735² (the '735 patent) as unpatentable under 35 U.S.C. § 103. We affirm.

I. BACKGROUND

A. The Invention

The invention is directed to a method of treating human mental disorders; the method involves treating depression in humans by the oral administration of 5-(3-dimethylaminopropylidene)dibenzo[a, d][1, 4] cycloheptadiene (commonly known as and hereafter referred to as "amitriptyline"), or the hydrochloride or hydrobromide salts thereof, in a particular dosage range. Amitriptyline has the following chemical structure:



776,464, Appeal No. 480-01 (PTO Bd.Pat.App. Feb. 25, 1982), JA p. 23.

2. U.S. Patent No. 3,428,735, issued to Edward L. Engelhardt on February 18, 1969, was based on patent application Serial No. 662,907 filed August 24, 1967 as a continuation-in-part of patent application Serial No. 855,981 filed Nov. 30, 1959.

As representative of the invention, claim 1 reads:

1. A method of treating human mental disorders involving depression which comprises orally administering to a human affected by depression 5-(3-dimethylaminopropylidene) dibenzo[a, d][1, 4]cycloheptadiene or its non-toxic salts in daily dosage of 25 to 250 mg. of said compound.

Remaining claims 2 and 3 are dependent from claim 1 and add limitations pertaining to the use of the hydrochloride and hydrobromide salts of amitriptyline, respectively.

B. Related Proceedings

On March 10, 1977 an application, Serial No. 776,464 (the '464 application), was filed for reissue of the '735 patent.² All the claims of the '464 application were finally rejected by the examiner under section 102 of title 35, United States Code, and alternatively under section 103 of that title. Subsequently, an appeal (Appeal No. 424-40) was taken to the Board⁴ which affirmed the examiner's rejections. Additionally, the Board entered a new rejection under 35 U.S.C. § 103 over a combination of references not previously cited by the examiner. In accordance with 37 C.F.R. § 1.196(b) (1985)⁵, appellant elected reconsideration of the '464 application by the examiner. The examiner maintained the rejection entered by the Board; in Appeal No. 480-01, the Board affirmed the examiner. The Board's decision was appealed to the Court of Customs and Patent Appeals (CCPA). Upon the motion of the Commissioner of Patents and Trademarks and on the authority of *In re Dien*, 680 F.2d 151, 214 USPQ

10 (CCPA 1982), the appeal was dismissed for lack of subject matter jurisdiction.⁶

The reissue application was protested by Biocraft Laboratories, Inc. (Biocraft), intervenor in the current appeal. Biocraft is also the plaintiff in a related litigation pending in the U.S. District Court for the District of New Jersey in which the validity and infringement of the '735 patent is in issue. See *Biocraft Laboratories Inc. v. Merck & Co.*, Civil Action No. 77-0693 (D.N.J.). The district court has stayed further action in that case pending the final outcome of the pending PTO proceedings.

C. Reexamination Proceeding

Following dismissal of the reissue appeal by the CCPA, Merck & Co., Inc. (Merck), the assignee of the '735 patent, filed for and was granted a request for reexamination of the patent. As a result of prosecution before the examiner, claims 1 through 3 of the reexamination application were finally rejected under 35 U.S.C. § 102 as anticipated by prior art references; the claims were also rejected under 35 U.S.C. § 103 as being obvious over references cited by the Board in its new ground of rejection entered during the initial reissue appeal. Finding the '735 patent to be entitled to the benefit of the November 80, 1959 filing date of its parent application, Serial No. 855,981, the Board reversed the section 102 rejection because the effective filing date of the application antedated all the references cited therein. The Board, however, sustained the rejection for obviousness under section 103. Expressly adopting the reasonings of its earlier reissue opinions, the Board took the position that in view of the prior art, in combina-

3. The reissue application was filed as a "no defect" type reissue under the then existing 37 C.F.R. § 1.175(a)(4) (1980). That provision has now been repealed.

4. At that time, the Board of Patent Appeals and Interferences was called the Board of Patent Appeals.

5. 37 C.F.R. § 1.196(b) provides that when the Board of Appeals determines a new ground of rejection, the appellant may

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(1) after submitting appropriate amendments or showing of facts, have the matter reconsidered by the examiner;

(2) waive reconsideration before the examiner and have the case reconsidered by the Board; or

(3) treat the decision, including the new ground of rejection, as a final decision in the case.

6. See *In the Matter of the Application of Edward L. Engelhardt*, Appeal No. 82-611 (CAFC Oct. 28, 1982) (order granting motion to dismiss).

tion, and a thorough knowledge of the investigative techniques used in the medicinal chemical art, the skilled artisan would have expected the known tricyclic compound, amitriptyline, to be useful as an antidepressant.

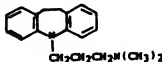
D. The References

The references relied upon by the Board were:

- (1) Rey-Bellet et al. (Rey-Bellet) U.S. Patent No. 3,384,663, May 21, 1968 (application filed Mar. 27, 1959);
- (2) Kuhn, *Schweizerische Medizinische Wochenschrift*, Vol. 87, No. 35-36, pp. 1135-1140 (Aug. 1957);
- (3) Lehman et al. (Lehman), *Canadian Psychiatric Association Journal*, "The Treatment of Depressive Conditions with Imipramine (G 22355)", vol. 3, No. 4, pp. 155-164 (Oct. 1958);
- (4) Friedman, *First Symposium On Chemical Biological Correlation*, "Influence of Isosteric Replacements Upon Biological Activity", pp. 296-358 (May 1950);
- (5) Burger, *Journal of Chemical Education*, "Rational Approaches to Drug Structure", Vol. 33, No. 8, pp. 362-372 (Aug. 1956);
- (6) Petersen et al. (Petersen), *Arzneimittel-Forschung*, Vol. 8, No. 7, pp. 395-397 (1958);
- (7) Roche Research Report No. 43,162, pp. 1-9 (Nov. 1957);
- (8) Roche Research Report No. 43,169, pp. 1-8 (Apr. 1958);
- (9) Roche Research Report No. 52,195, pp. 1-13 (Sept. 1958) (collectively called the "Roche Reports").

The Rey-Bellet patent disclosed amitriptyline and its hydrochloride salt. Properties of amitriptyline taught by the reference included a "manifold activity upon the central nervous system," as well as pharmacological and medicinal properties, such as "narcosis-potentiating, adrenolytic, sedative, antihistaminic, antiemetic, antipyretic and hypothermic." Rey-Bellet did not disclose or otherwise teach that amitriptyline possessed antidepressive properties.

The Kuhn publication disclosed the compound, imipramine, and taught that the compound was a very effective antidepressant in humans. Imipramine has the chemical structure



Imipramine

and differs from the structure of amitriptyline only in the replacement of the unsaturated carbon atom in the center ring with a nitrogen atom. Kuhn taught a recommended dosage of 75-150 mg per day—possibly 200-250 mg if the smaller doses proved ineffective.

The Lehman publication disclosed the results of a Canadian study of the effects of imipramine on the symptoms of depression in humans. This article confirmed, for the most part, the teachings of the Kuhn article.

The object of the Friedman publication was "to survey the history of isosterism, to classify the varieties of isosteric replacements which are recorded in the literature, and to note the influence of these replacements on the biological activity of compounds." Friedman defined isosteres as atoms, ions or molecules in which the peripheral layers of electrons can be considered identical. Compounds which fit this broad definition and exhibit the same biological activity were termed "bioisosteric." Further, with respect to the medicinal chemists' use of the theory of "isosteric replacement" or "bio-isosteric replacement" as a tool to predict the properties of compounds, Friedman commented that:

[t]o the synthetic organic chemist interested in medicinal chemistry, every physiologically active compound of known structure is a challenge—a challenge either to better it, or perhaps merely to equal it....

There are numerous ways of attacking such a problem.... One of the methods which has been used frequently, very

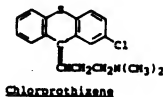
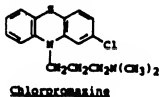
often with success, is that of isosteric replacement. The examples of this type of replacement in the literature are very numerous, and the fruitful results in the fields of sulfonamides, antimetabolites, and antihistamines are well known.

Friedman at page 296. Finally, Friedman disclosed various atoms or groups of atoms as bioisosteric, including the interchange of oxygen and the unsaturated carbon atom which often resulted in similar biological activity. Friedman, however, did not disclose or otherwise teach as bioisosteric the

interchange of the nitrogen and unsaturated carbon atoms.

The Burger publication also discussed the theory of "bioisosterism" and its usefulness in designing new drugs based upon the knowledge of "lead" compounds.

The Petersen publication taught, *inter alia*, the properties of chlorpromazine (a phenothiazine derivative) and chlorprothixene (a 9-amino-alkylene-thioxanthene derivative), these compounds having the following structural formulas:



Petersen concluded that, when the nitrogen atom located in the central ring of the phenothiazine compound is interchanged with an unsaturated carbon atom as in the corresponding 9-amino-alkylene-thioxanthene compound, the pharmacological properties of the thioxanthene derivatives resemble very strongly the properties of the corresponding phenothiazines. Using the theory of isosteric replacement, Petersen predicted this similarity in properties:

Structural chemical considerations permitted the expectation that the 9-amino-alkylene-thioxanthenes ... would show great similarity to the corresponding phenothiazines. They should be more similar in their behavior to that of the phenothiazines than the saturated 9-amino-alkyl-thioxanthenes. From the physical point of view the π -electron distributions (sites of π -electrons) are almost the same in the phenothiazine derivatives and in the 9-aminoalkylene-thioxanthenes with their stabilizing conjugated double linkage between C9 in the thioxanthene ring and the first C-atom of the side chain.

Petersen at page 3. The compounds were disclosed as having a strong central depressive, i.e., tranquilizing, action in animals.

The Roche Reports revealed the results from tests comparing the pharmacological properties of amitriptyline and imipramine. The reports indicated that the two compounds were very similar in a variety of properties, including their action as tranquilizers having narcosis-potentiating effects. Because of this similarity and because amitriptyline and imipramine were structurally related, Roche scientists concluded that amitriptyline should be clinically tested for depression alleviation—a known property of imipramine. In the pharmacological guideline for the clinical testings of amitriptyline (which was labelled Roche Preparation Ro 4-1575), the Roche Reports stated that

[i]t is to be noted that a "tofranil-like effect" is already to be expected by using a dose $1/4$ - $1/2$ that of Tofranil. Side effects which can appear ... are sedative and atropine-like effects, such as appear also with Tofranil.^[7]

We must decide in this appeal whether appellant's invention would have been *prima facie* obvious over the available prior art of record; and, if so obvious, whether

7. Tofranil is a trademark used for imipramine.

the prima facie case has been rebutted by evidence of unexpected results.

II. DISCUSSION

In its opinion on this problem, the Board expressly followed the guidelines of *Graham v. John Deere Co.*, 383 U.S. 1, 17-18, 86 S.Ct. 684, 693-694, 15 L.Ed.2d 546, 148 USPQ 459, 466-67 (1966), and made findings on factual inquiries specifically set forth in that decision. These factual findings must be accepted unless they are clearly erroneous. *In re Wilder*, 736 F.2d 1516, 1520, 222 USPQ 369, 372 (Fed.Cir. 1984), cert. denied, 469 U.S. 1209, 105 S.Ct. 1173, 84 L.Ed.2d 323 (1985); *In re De Blauwe*, 736 F.2d 699, 703, 222 USPQ 191, 193 (Fed.Cir.1984); accord *Stock Pot Restaurant, Inc. v. Stockpot, Inc.*, 737 F.2d 1576, 1578-79, 222 USPQ 665, 666-67 (Fed. Cir.1984). In this case we do not hold the Board's factual findings—as to the scope and content of the prior art, the differences between the prior art and the claims at issue, and the level of ordinary skill in the art—to be clearly erroneous and accordingly we have followed them in our statement of the prior art and we now follow them in our analysis of the legal issue of obviousness.

[1] *Prima Facie Obviousness*: The prior art taught that amitriptyline and imipramine are both psychotropic drugs which react on the central nervous system and which were known in the art prior to the time of appellant's invention. Imipramine was known to possess antidepressive properties in humans. While amitriptyline was known to possess psychotropic properties such as sedative and narcosis-potentiating properties, the drug was not known to be an antidepressant. However, the prior art has shown that imipramine and amitriptyline are unquestionably closely related in structure. Both compounds are tricyclic dibenzo compounds and differ structurally only in that the nitrogen atom located in the central ring of imipramine is interchanged with an unsaturated carbon atom

in the central ring of amitriptyline. To show obviousness, it was necessary to determine from knowledge already available in the art at the time of appellant's invention that one skilled in the medicinal chemical art would have expected amitriptyline, like imipramine, to be useful in the treatment of depression in humans. *In re Papesch*, 315 F.2d 381, 137 USPQ 43 (CCPA 1963).

As found by the Board, the Roche Reports recognized the structural relationship between amitriptyline and imipramine and concluded that amitriptyline should be tested for its antidepressant activities. In fact, the Roche Reports expressly stated that amitriptyline was expected to resemble imipramine clinically in its depression alleviation effects.

"Structural similarity, alone, may be sufficient to give rise to an expectation that compounds similar in structure will have similar properties." *In re Payne*, 606 F.2d 303, 313, 203 USPQ 245, 254 (CCPA 1979). However, the Board did not rest its conclusion of obviousness on structural similarity alone. Rather, the Board further recognized that in attempting to predict the biological activities of a drug, a skilled medicinal chemist would not proceed randomly, but would base his attempts on the available knowledge of prior research techniques, and literature used in his field. The prior art showed that one such technique was "bioisosteric replacement" or the theory of bioisosterism—where the substitution of one atom or group of atoms for another atom or group of atoms having similar size, shape and electron density provides molecules having the same type of biological activity. Finding that the Friedman, Burger and Petersen references taught that bioisosterism was commonly used by medicinal chemists prior to 1959 in an effort to design and predict drug activity, the Board concluded that one of ordinary skill in the arts would have been aware of this technique at the time of appellant's invention.⁵ Further, the Board

8. Appellant submitted the declaration of Dr.

Paul N. Craig, an experienced medicinal chem-

found that Petersen taught as bioisosteric the interchange of the nitrogen and unsaturated carbon atoms—the precise structural difference between imipramine and amitriptyline.⁹

We see no clear error in the Board's determination as to the teachings of the prior art references, in combination. In view of these teachings, which show a close structural similarity and a similar use (psychotropic drugs) between amitriptyline and imipramine, one of ordinary skill in the medicinal chemical arts, possessed of the knowledge of the investigative techniques used in the field of drug design and pharmacological predictability, would have expected amitriptyline to resemble imipramine in the alleviation of depression in humans. Accordingly, we agree with the Board that appellant's invention was *prima facie* obvious over the prior art of record.

[2-4] In traversing the Board's decision of obviousness, appellant has urged that the Board's decision was premised on an impermissible "obvious to try" standard. Appellant contends that there was no motivation in the prior art to arrive at appellant's invention. "[O]bvious to try is not the standard of 35 U.S.C. § 103." *In re Antonie*, 559 F.2d 618, 620, 195 USPQ 6, 8 (CCPA 1977) (emphasis omitted). Rather, the test is whether the references, taken as a whole, would have suggested appellant's invention to one of ordinary skill in the medicinal chemical arts at the time the invention was made. *In re Simon*, 461

F.2d 1387, 1390, 174 USPQ 114, 116 (CCPA 1972). Clearly, amitriptyline and imipramine, both known psychotropic drugs, are closely structurally related. The expectation that the similar structures would behave similarly was suggested in the Roche Reports. In combination with those teachings, the prior art teaching that the precise structural difference between amitriptyline and imipramine involves a known bioisosteric replacement provides sufficient basis for the required expectation of success, without resort to hindsight.¹⁰ Obviousness does not require absolute predictability. *In re Lamberti*, 545 F.2d 747, 750, 192 USPQ 278, 280 (CCPA 1976). Only a reasonable expectation that the beneficial result will be achieved is necessary to show obviousness. *In re Longi*, 759 F.2d 887, 897, 225 USPQ 645, 651 (Fed.Cir.1985).

[5] We also find untenable appellant's arguments that Petersen teaches away from appellant's invention. Non-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references. *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). Thus, Petersen must be read, not in isolation, but for what it fairly teaches in combination with the prior art as a whole. That teaching is that the interchange of the nitrogen and the unsaturated carbon atoms is isosteric and compounds so modified are

is, JA p. 372. His view was that the concept of bioisosterism could not be used in 1959 to predict the antidepressant effects in amitriptyline or the pharmacological differences between imipramine and amitriptyline. Dr. Craig stated:

[I]n my opinion "isosterism" in 1959 afforded no basis for predicting the specific pharmaceutical utility in humans, and it is my belief that that is still true today.... I do not believe the carryover of tranquilizing activity from chlorpromazine to chlorpromazine afforded a reasonable basis for predicting the carryover of antidepressant properties from imipramine to amitriptyline.

Affidavit of Paul N. Craig, JA, pp. 374-75. Plainly the Board was not clearly erroneous in discounting that testimony. There was undisputed evidence in the record to the contrary. The Friedman, Burger and Petersen references

recognize that concept as a means of predicting biological properties in isosterically-related compounds prior to 1959.

9. Petersen even went so far as to suggest that the apparent bioisosteric relationship between the interchange of the nitrogen and unsaturated carbon atoms led to the design of chlorpromazine in the expectation that the compound would share the same biological activity as chlorpromazine. See Petersen, *supra*, at p. 395.

10. The teachings of the Roche Reports as well as the Petersen reference distinguish this case from *In re Grabiak*, 769 F.2d 729, 731, 226 USPQ 870, 871 (Fed.Cir.1985) ("there is no motive in the cited art to make the modification required to arrive at appellants' compounds").

expected to possess similar biological properties.

[6] Neither are we persuaded by appellant's contention that the Board erred in relying on the contemporaneous independent invention of others to support its holding of obviousness.¹¹ As we have said earlier, the teachings of the prior art references in combination adequately support the Board's conclusion. However, the additional, although unnecessary, evidence of contemporaneous invention is probative of "the level of knowledge in the art at the time the invention was made." *In re Farrenkopf*, 713 F.2d 714, 720, 219 USPQ 1, 6 (Fed.Cir.1983).

[7, 8] *Unexpected Results*: A prima facie case of obviousness can be rebutted by evidence of unexpected results. *In re Davies*, 475 F.2d 667, 670, 177 USPQ 381, 384 (CCPA 1973). In rebuttal of the PTO's prima facie case appellant has asserted that, as compared to imipramine, amitriptyline unexpectedly has a more potent sedative and a stronger anticholinergic effect. In support of this contention, appellant has relied on an affidavit of Dr. Joseph J. Schildkraut,¹² a psychiatrist and a Professor of Psychiatry at Harvard, and also on a published record of a symposium of physicians and psychiatrists concerned with the treatment of the depressed patient.¹³

Dr. Schildkraut's affidavit recognizes some pharmacological differences between amitriptyline and imipramine including the fact that amitriptyline is a more potent sedative and has a stronger anticholinergic

effect than imipramine. Further, Dr. Schildkraut notes that depressed patients have responded differently to amitriptyline and imipramine, some responding to one and not the other or more favorably to one than to the other. For the most part, the record of the cited symposium confirms the differences noted in the Schildkraut affidavit.¹⁴ That record also counseled practicing physicians on choosing from the spectrum of tricyclic antidepressants (a term which includes amitriptyline and imipramine) the particular drug useful for an individual patient.

After a careful consideration of all the evidence, we are persuaded that the Board did not err in determining that the alleged unexpected properties of amitriptyline are not so unexpectedly different from the properties of imipramine, the closest prior art, as to overcome the prima facie showing of obviousness. The prior art of record clearly taught that amitriptyline was a known sedative.¹⁵ The evidence before us (which was, of course, before the Board) further revealed that all tricyclic antidepressant drugs, in general, possess the secondary properties of sedative and anticholinergic effects. Specifically, the record showed that during the prosecution of the reissue application, appellant submitted an article entitled "Using the tricyclic antidepressants" which included a table comparing the properties of known tricyclic antidepressant drugs.¹⁶ Included in these properties were sedative and anticholinergic effects of the known antidepressants.¹⁷

11. *Ex Parte Edward L. Engelhardt*, Appeal No. 424-40, *supra* note 1, at pp. 23-24, JA pp. 22(1)-22(m), where the Board indicated that evidence before it revealed that four other groups of inventors independently and contemporaneously discovered amitriptyline's antidepressant properties using reasoning based on a thorough knowledge of investigative techniques, which included the concept of isoterism, used in the medicinal art area.

12. Affidavit of Joseph J. Schildkraut, JA p. 366.

13. Symposium, *Depression Today—Experts Answer Your Questions*, JA p. 309.

14. Dr. Schildkraut was a member of the symposium.

15. *Rey-Bellet*, *supra*, col. 2, line 16.

16. *Patient Care*, "Using the Tricyclic Antidepressants," pp. 28-33, 35-36, 39-40, 43-45, 49-52, 57-58, 63-64, 67-68, 71, 73-76, 78, 81, 84-85, (May 15, 1979); see also Commission's Appendix, pp. CA 17-45.

17. See also the Symposium, *Depression Today—Experts Answer Your Questions*, *supra* note 13, at p. 315, where Dr. Hollister indicates that when choosing from the spectrum of tricyclic antidepressant drugs, the choice is based on three pharmacological actions including (1) the amount of sedation (2) the amount of anticholinergic effect and (3) the nature of the drugs in

Thus, it appears that the alleged difference in properties between amitriptyline and imipramine is a matter of degree rather than kind. Moreover, as to the sedative effects, the article revealed only a slight difference between the two compounds. Amitriptyline was characterized as "highly sedative" while imipramine was only "somewhat less [sedative] than amitriptyline."¹⁸ Regarding the anticholinergic effect, the article showed that both drugs have anticholinergic effects but to a different degree. These are not truly unexpected results. The Board found in one of its reissue opinions (incorporated in the reexamination decision now on appeal): "[I]n regard to the sedative and anticholinergic properties of amitriptyline, we are not convinced that the side effects of this material [amitriptyline] are significantly or unexpectedly different from the level of those properties exerted by the closest prior art antidepressant, imipramine."¹⁹

The core of it is that, while there are some differences in degree between the properties of amitriptyline and imipramine, the compounds expectedly have the same type of biological activity. In the absence of evidence to show that the properties of the compounds differed in such an appreciable degree that the difference was really unexpected, we do not think that the Board erred in its determination that appellant's evidence was insufficient to rebut the prima facie case. The fact that amitriptyline and imipramine, respectively, helped some patients and not others does not appear significant. As noted by the Board, a difference in structure, although slight, would have been expected to produce some difference in activity.

In sum, we hold that the claimed invention would have been obvious to one of ordinary skill in the art. Accordingly, the decision of the Board is

AFFIRMED.

primarily blocking the uptake of serotonin or norepinephrine.

18. *Patient Care*, "Using the Tricyclic Antidepressants," *supra* note 16, at p. 50.

BALDWIN, Circuit Judge, dissenting.

The rejection by the board is flawed because it did not analyze the invention according to the requirement of 35 U.S.C. § 103. The board wrote:

The issue before us in considering the instant claims on their merits for patentability is whether the artisan having the requisite skill in the pertinent art area and a knowledge of the available prior art would have been motivated to employ amitriptyline in the treatment of human depression.

That is, whether it would have been obvious to try amitriptyline as an antidepressant. Guided by the disclosure of the applicant, the board pieced together information from various patents, journal articles, and papers, and concluded:

It remains our position that one having ordinary skill in this art are[sic] would have been familiar with the concept of bioisosterism and because of this knowledge would have concluded that the known compound, i.e., amitriptyline, would be *potentially* useful as an antidepressant. [Emphasis ours.]

That is, it would have been obvious to try amitriptyline as an antidepressant. Obvious-to-try is not the test for patentability under 35 U.S.C. § 103. This court and its predecessor, the CCPA, have repeatedly rejected that approach. *In re Goodwin*, 576 F.2d 375, 377, 198 USPQ 1, 3 (CCPA 1978); *In re Antonie*, 559 F.2d 618, 620, 195 USPQ 6, 8 (CCPA 1977); *In re Lindell*, 385 F.2d 453, 455, 155 USPQ 521, 523 (CCPA 1967); *In re Tomlinson*, 363 F.2d 928, 150 USPQ 623 (CCPA 1966); *In re Papesch*, 315 F.2d 381, 137 USPQ 43 (CCPA 1963); see also *In re Grabiak*, 769 F.2d 729, 226 USPQ 870 (Fed.Cir.1985).

Congress has also rejected that approach by enacting the second sentence of 35 U.S.C. § 103, which states "[p]atentability shall not be negated by the manner in

19. *Ex Parte Edward L. Engelhardt*, Appeal No. 480-01, *supra* note 1, at p. 12, JA p. 34.

which the invention was made." The reviser's note on this sentence states "it is immaterial whether it resulted from long toil and experimentation or from a flash of genius."

The obvious-to-try analysis is an attack on the method of making an invention that specifically penalizes people in areas of endeavor where advances are won only by great effort and expense. The pharmaceutical field is particularly hard hit because there is an overabundance of structures that are obvious to try. Consider, for example, the Petersen reference which the majority cites to demonstrate the possibility that a nitrogen atom may be replaced by a double-bonded carbon atom. This journal article records an attempt to find drugs useful for the treatment of endogenous psychoses, i.e., tranquilizers. The researchers tested eighteen chemicals with closely related structures. These materials were injected into mice, and compared for their ability to make the mice fall asleep. The results of these tests may be tantalizing and useful, but only as a guide for further research. I agree that, based on this information and the other references cited by the board, the researcher with ordinary skill in the art would be motivated to investigate the possibility of substituting a double-bonded carbon atom for nitrogen. The researcher would also be motivated to test every other structural variation in Petersen, as well as a host of others. Under an obvious-to-try analysis, any of these structures which ultimately is shown to be effective as an antidepressant in human beings would be unpatentable because the researcher dared to follow a logical plan.

The board and the majority also err by reading too much certainty into the teachings of the references. They have not considered the references as a whole. Friedman discusses the phenomenon that com-

pounds with similar chemical structures sometimes behave in a similar fashion in a biological system. Once such a compound has been tested and found to have the same biological activity, it is called "bio-isosteric."¹

Friedman also teaches that an isosteric compound "may have the same activity as the original, or more usually it may have an antagonistic effect." (Emphasis added.) Friedman explains that in order to predict biological activity with accuracy, one ideally should know (1) the mechanism by which the original drug acts and (2) what part of the structure of the original drug is critical to the original drug activity.² That reference also unequivocally states that comparisons should be made in living systems, but such information is not easily available. That reference relies on *in vitro* testing, and it specifically states that *in vitro* results may or may not correlate with clinical studies. It also clearly states that, for the purposes of its discussion, biological activities such as absorption, distribution, conjugation (detoxification), taste, odor and *side effects of drugs* will be ignored. Friedman concludes that compounds with similar structures need not be bio-isosteric.

The Burger reference does discuss bio-isosterism and its usefulness in designing new drugs. Its evaluation of bio-isosterism as a tool for predicting drug activity is as follows:

However, if one can achieve a gradual change of biological behavior and follow it accurately at each step of minor structural alteration, one is bound to enhance one property, suppress another, and ultimately arrive at a drug suitable for therapy. Shortcuts to this disconcertingly tedious process have not been found, and this is probably responsible for the still

human beings. The theory of bio-isosterism as used by the board and majority is nothing more or less than an analysis of structural obviousness.

1. The term "bio-isosteric" therefore is simply a conclusion drawn after testing. The label is properly limited to the system and purpose for which the compounds were tested. For example, two drugs could be bio-isosteric with respect to making mice fall asleep, and not bio-isosteric when tested at a particular dosage level for the treatment of high blood pressure in

2. Neither this reference nor any of the others purport to disclose either piece of information.

prevailing opinion that new useful drugs will be discovered most easily by more or less empirical procedures.

at page 369, and

Slight stereochemical or structural changes may alter considerably the biological role of a compound. Patient variation of at least a reasonable number of structures is still the only answer to this question.

at page 370.

The Roche reports contain background information about various pharmacological effects of amitriptyline. The information was derived from testing for its toxicity and tranquilizing effect on animals. This information would be essential to a decision to clinically test the drug. It is not sufficient to show the drug would be useful for treating human beings. Congress gave pragmatic recognition to the difficulty of determining whether a new drug is useful by its enactment of the 1962 amendment to 21 U.S.C. § 321. That action was taken in response to problems caused by another tranquilizer, thalidomide.

Neither these references, nor the other references cited by the board and the majority purport to teach the worker with ordinary skill in the art that amitriptyline is a drug that is useful for treating depression in human beings. That conclusion is steps removed from the information presented by these sources. I would reverse.

ROLLS-ROYCE LIMITED and
Renishaw, plc, Appellees,

v.

GTE VALERON
CORPORATION, Appellant.

Appeal No. 86-761.*

United States Court of Appeals,
Federal Circuit.

Sept. 8, 1986.

Action was brought seeking injunction and damages for alleged infringement of four patents, in which alleged infringer claimed invalidity and counterclaimed for unfair competition. The United States District Court for the Eastern District of Michigan, 625 F.Supp. 343, Horace W. Gilmore, J., entered judgment for patent holders. Appeal and cross appeals were taken. The Court of Appeals, Markey, Chief Judge, held that: (1) claim 15 of patent for device to mount stylus in position-determining apparatus was not invalid for anticipation or obviousness in view of two references; (2) claims of chain patents for six-way probe were infringed by five-way probe; and (3) alleged infringer did not willfully infringe stylus patent when it attempted to design around claims and failed to seek advice of counsel as to infringement.

Affirmed.

1. Patents \approx 51(1)

Test to determine whether patent was invalid for anticipation was disclosure in a single, prior art reference of each element of claim under consideration. 35 U.S.C.A. § 102.

2. Patents \approx 312(6)

District court's findings that prior art references did not disclose three points of mechanical contact to achieve positively defined rest position and that prior art refer-

* On January 31, 1986, this court ordered consolidation of Rolls-Royce's cross-appeal, No. 86-



Application of Stephen F. ROYKA
and Robert G. Martin.
Patent Appeal No. 9092.

United States Court of Customs
and Patent Appeals.
Feb. 7, 1974.

Joseph F. Nakamura, Washington, D. C., for the Commissioner of Patents.
Fred W. Sherling, Washington, D. C., of counsel.

Before MARKEY, Chief Judge, and
RICH, BALDWIN, LANE and MILLER,
Judges.

RICH, Judge.

Appeal from the decision of the Patent Office Board of Appeals affirming the examiner's rejection of patent application, Serial No. 648,701, for a "responsive answer system." The Court of Customs and Patent Appeals, Rich, J., held that an answer sheet for use in self-instruction and testing, in which were printed in "response areas" meaningful information in permanent printing and confusing information in printing which could be removed, as by an erasure, both being legible so that a student, seeing a choice of answers to a question, was required to make a selection, the correctness of the selection being shown by the information which was then removed by the erasure, was not anticipated by prior patents and was therefore patentable.

Reversed.

Patents \S 66(1.20)

"Responsive answer system," answer sheet for use in self-instruction and testing, in which were printed in "response areas" meaningful information in permanent printing and confusing information in printing which could be removed, as by erasure, both being legible so that student, seeing choice of answers to question, was required to make selection, correctness of selection being shown by information which was then removed by erasure, was not anticipated by prior patents and was therefore patentable. 35 U.S.C.A. \S 102, 103.

Michael H. Shanahan, Rochester, N. Y., of record, for appellant; Thomas M. Webster, Rochester, N. Y., Boris Haskell, Washington, D. C. (Paris, Haskell & Levine), Washington, D. C., of counsel.

This appeal is from the decision of the Patent Office Board of Appeals affirming the examiner's rejection of claims 28 and 30-36 of application serial No. 648,701, filed June 26, 1967, entitled "Responsive Answer System." We reverse.

The Invention

The appealed claims are directed to a device in the nature of an answer sheet for use in self-instruction and testing. The answer sheet may be associated with questions or separate therefrom. The essential features of the invention are that there are printed on the answer sheet in "response areas" meaningful information in permanent printing and confusing information in printing which can be removed, as by an eraser, both being legible so that a student, seeing a choice of answers to a question, must make a selection. Having made a selection, he then applies an eraser to the selected response area and some of the information will be readily removed. What remains advises him of the correctness or otherwise of his answer. The following figures from the drawings are illustrative:

PERMANENT MEANINGFUL
INFORMATION PLUS REMOV-
ABLE CONFUSING INFORMA-
TION.

A. TRUE
ES
WRONG

B. FALSE
YES
RIGHT

FIG. 1A

PERMANENT MEANINGFUL
INFORMATION

A. YES

B. NO

FIG. 1B

Fig. 1A shows two response areas to a given question before any removing ac-

tion by the student has taken place and Fig. 1B shows the permanent information remaining in each after erasure of the removable information. Of course, if the student makes an initial choice of area A, showing up "YES" or some other indication of a correct answer, he will not need to proceed further and erase the B area. In a modified form of the invention, a wrong selection, plus erasure, may expose, instead of or in addition to a statement that the answer is wrong, a number or other reference to further material which is to be studied.

A preferred method of printing the permanent meaningful information and the removable confusing information is by that type of xerography in which a fusible toner is used, the permanence of the printing depending on the extent to which the toner image is "fixed" or fused by heat. By successive printings of the two kinds of information with fixing to different degrees, one image can be made permanent and the other made subject to easy removal, both images retaining such similarity of appearance that the user of the answer sheet cannot tell them apart.

Claim 28 is the principal claim, all others being dependent thereon, and reads as follows:

28. A device for selectively indicating information comprising

a support having response areas for presenting information for selection, permanent printing indicative of meaningful information permanently fixed to said support within a response area, and

removable printing indicative of confusing information removably fixed to said support within a response area, said meaningful and confusing information being substantially legible even when said permanent and removable printing are fixed over one another on said support,

said permanent and removable printing being substantially similar such that an observer cannot determine

which information is permanent and which is removable

whereby the information within a response area is selected by attempting to remove the printing thereon with the failure to remove printing identifying meaningful information.

Claims 30-36 add limitations which need not be considered except for noting that claims 33 and 34 alone specify the use of a xerographic toner, for which reason they were rejected on a different ground from the other claims.

The Rejection

The following references were relied on:

Reid et al. (Reid)	356,695	Jan. 25, 1987
Bernstein et al. (Bernstein)	3,055,117	Sep. 25, 1962
Lein et al. (Lein)	3,364,857	Jan. 23, 1968 (filed Feb. 2, 1966)

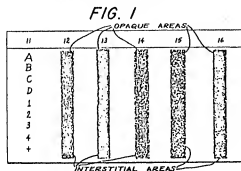
Claims 28, 30, 31, and 32 were rejected as anticipated under 35 U.S.C. § 102 by Bernstein; claims 28, 31, 32, 35, and 36 were rejected as anticipated under § 102 by Reid; and claims 33 and 34 were rejected under 35 U.S.C. § 103 for obviousness, on either Bernstein or Reid in view of Lein. These were the examiner's rejections and the board affirmed them, adhering to its decision on reconsideration.

Bernstein discloses an answer sheet in which printed information representing a response is "temporarily concealed from the observer" and he discloses a number of different ways of effectively concealing the response. His specification states:

The objects of the invention are accomplished by utilizing the hiding media to confuse the participant and to render the response and the hiding media indistinguishable and thus conceal the presence, absence, nature or position of the response from the participant. This may be effectuated by careful attention being paid to a number of factors including the design,

color and position of the hiding or confusing media.

Fig. 1 of Bernstein's drawings, illustrates some of his concealing means:



The following is the written description:

Referring now to the drawing, FIG. 1 illustrates some of the many optically confusing patterns which may be positioned between the printed structure to be concealed and the point of observation. Column 11 shows the information which is to be concealed. This information is repeated in columns 12 through 16 but in each case is concealed by a pattern in accordance with the present invention. Column 12 utilizes a pattern comprising an alphabetical maze in both line and half tone screen. Column 13 utilizes a pattern comprising an absorbing field having a plurality of irregular dot-like interstices. Column 14 utilizes a pattern comprising a maze of plus signs combined with dots. Columns 15 and 16 illustrate irregular and non-repetitious patterns.

Bernstein says that if at least 50% of the response is actually covered by the opaque portions of the confusion pattern, complete concealment is obtained. He also says that added means of concealment may be used, such as scoring and embossing and perforating the paper in order to scatter the light or let it shine through.

Reid is entitled "Transformation Picture and Print." The invention is said to be useful for advertisements, Christmas cards, birthday cards, valentines, and the like and as a source of amuse-

ment and instruction for children. It consists of a picture or print, part of which is permanently printed and part of which is removable from the paper on which it is printed. For the latter various soluble undercoatings or inks are described. If the picture is washed with a solvent, which may be water, the removable part disappears and the pictorial and/or typographic matter changes. The invention is illustrated by a typical nineteenth century temperance propaganda piece depicting the evils of drink. In the finished picture there are three scenes from left to right: Scene 1, the innocent child leads her father home from the pub; Scene 2, Father sits slumped in the kitchen chair with his bottle beside him, the family wash hanging above his head, this picture being entitled "The Effects of Drink"; Scene 3, Mother stands in front of a sign reading "Pawn Shop." Across the bottom of the picture is a legend which says "Wash the above and see what water will do." Fig. II shows the result of washing with water: Scene 1, a handsome young man and his happy daughter stroll on the street; Scene 2, Father sits erect in a well-appointed room at a cloth-covered table, apparently having a cup of tea, obviously a gentleman; Scene 3, Mother beams from the sideline and the Pawn Shop sign has vanished. Two new subscriptions appear and the words "The" and "Drink" have disappeared, the resultant being a new picture title reading "The Beneficial Effects of Temperance." "The Beneficial" and "Temperance" were covered by some soluble opaque in the original picture. No doubt the overall effect is instruction. Perhaps there was amusement in bringing about the transformation.

Lein relates to xerography and is relied on only for its disclosure of the removability of partially fused toner and the permanence of fully fused toner.

OPINION

As to the § 102 anticipation rejections, it will suffice to consider independent claim 28. If it is not fully met by Reid

or Bernstein, neither are the more limited dependent claims. It is elementary that to support an anticipation rejection, all elements of the claim must be found in the reference. We do not find claim 28 anticipated by Bernstein because, as we read the claim, it requires the display of *legible* meaningful and *legible* confusing *information* simultaneously, between which the user of the device may make a selection before he undertakes to remove any of the information from the response area selected by him. The element we find most clearly missing, contrary to the reasoning of the examiner and the board, is the legible confusing *information*. The Patent Office proposes to read this limitation on Bernstein's confusion patterns which are nothing but meaningless obscuring screens, conveying no information and providing the user with no basis for making a *selection*, as called for by claim 28. In appellants' device the legible confusing information—i. e., the wrong answers—are legible in the sense that they can be read as intelligible words, not merely a jumble of type serving to obscure the words of the wrong answers.

Appellants were fully aware of Bernstein and discussed its disclosures in their specification, distinguishing from this and other prior art, saying, in part:

The inventive concept hereof confuses not by physical blocking as taught by the prior art, but by compounding, associating (including disarranging) permanent information with confusing information, usually at least some of which is similar in character to the permanent information as to render it impossible to tell which is permanent and which is removable confusing information. In the invention, generally no attempt is made to designedly physically cover the permanent information, but to confuse it beyond interpretation by the presentation of extraneous removable, confusing information.

Claims are not to be read in a vacuum and while it is true they are to be given

the broadest *reasonable* interpretation during prosecution, their terms still have to be given the meaning called for by the specification of which they form a part. We cannot read the terms "legible" and "information" on Bernstein's confusion patterns, as did the examiner and the board. They are not "legible," as appellants use the term, and they convey no information.

As to anticipation by Reid, we find neither appellants' basic concept nor the substance of claim 28 to be disclosed. Apparently the solicitor could find little to support the rejection in Reid for all he says in his brief—so far as claim 28 is concerned—is:

Reid discloses a sheet which may be used for instruction and which may have a removable design partly covering a fixed design * * *. Therefore, the disclosure of the reference encompasses the arrangement wherein a removable design covers a fixed design with both designs being substantially legible.

But claim 28 does not call for an arrangement wherein a removable design covers a fixed design. It calls for response areas, which Reid does not have, containing meaningful information in permanent printing together with removable printing conveying confusing information, both legible at the same time, between which a "selection" can be made. The only choice offered to the user by Reid is to follow the instruction to wash the whole visible picture with water or other solvent, thus removing the overprinting, to discover what the permanent picture is. The Patent Office attempt to read claim 28 on this reference is a tour de force. We hold that Reid does not anticipate for failure to meet the limitations of claim 28 to "response areas," to the presentation of two categories of information (meaningful-permanent and removable-confusing) within such areas, and the possibility of selection. Anticipation requires a finding that the claimed invention be disclosed. It is not enough to say that appellants' invention and the reference are

both usable for instruction and both consist of permanent and removable printings on paper, as did the solicitor.

The dependent claims rejected with claim 28, as anticipated under § 102, are not anticipated since claim 28 is not anticipated. Some of them merely add features which are disclosed by the references and some do not. Insofar as they do not, they further negative anticipation. The examiner recognized this fact as to claims 33 and 34, which are limited to xerography, and therefore did not reject them under § 102. Similarly, he did not reject claim 30 on Reid or claims 35 and 36 on Bernstein. We find that claims 35 and 36 contain limitations which additionally distinguish from Reid. We have already noted that Reid has no "response areas" as required by claim 28 and so Reid does not disclose the structure of claim 35 which additionally requires both the correct and incorrect answers to appear within the same response area.

As to claim 36, the examiner said it "is merely a printed matter variation of the design of the reference," Reid. This is not a valid reason for rejection. Printed matter may very well constitute structural limitations upon which patentability can be predicated. We have commented on this matter in *re Jones*, 373 F.2d 1007, 54 CCPA 1218 (1967); and in *re Miller*, 418 F.2d 1392, 57 CCPA 809 (1969), and will not repeat ourselves. The limitations of claim 36 are not remotely suggested by Reid.

There remains the § 103 rejection of claims 33 and 34. Do they, taken together with all of the limitations of claim 28 from which they depend, define obvious subject matter? The difference between claim 28 and these two dependent claims is that they add the limitations to xerography. If Bernstein and Reid showed the claimed invention except for xerography, the addition of the Lein reference would make the subject matter of the claims obvious. But that is not the situation here. Adding the knowledge of xerographic technology to Bernstein or Reid still does not make the

invention of claims 33 and 34 obvious for the same reasons we have given above in discussing anticipation. The essence of appellants' invention, as set forth in claim 28, is still missing notwithstanding the addition of the Lein reference and we see nothing in the combinations of references which would have made the invention obvious to one of ordinary skill in the art at the time it was made. We will, therefore, reverse this rejection.

The decision of the board is reversed.

Reversed.



CHRYSLER CORPORATION, Plaintiff-Appellant,

v.

John T. DUNLOP, Director Cost of Living Council, et al., Defendants-Appellees.

No. DC-18.

**Temporary Emergency Court of Appeals.
Dec. 5, 1973.**

In manufacturer's action for declaratory and injunctive relief with respect to order of the Cost of Living Council deferring consideration of the merits of manufacturer's proposed price increase, the United States District Court for the District of Columbia, Barrington D. Parker, J., denied preliminary injunction, and manufacturer appealed. The Temporary Emergency Court of Appeals held that if the order was not supported by substantial evidence, manufacturer would have substantial likelihood of prevailing on the merits, that the trial court should have made findings of fact and conclusions of law on the question of whether the order was supported by substantial evidence, and that the trial court should consider manufacturer's proposal that it would escrow all moneys

King argues that the wide disparity in punishments for crimes involving crack cocaine and those involving powder cocaine violates the Constitution's guarantee of equal protection in that it has a discriminatory impact on black persons. King argues that crack cocaine is predominantly used by blacks, and that powder cocaine is predominantly used by whites.¹ Thus, he argues that blacks are punished much more severely for using cocaine than are whites.

The parties agree that the appropriate level of scrutiny is the rational basis test, since King has not alleged a discriminatory intent on the part of Congress. Thus, we apply the rational basis test.²

[1,2] To pass the rational basis test, the legislation must have a legitimate purpose, and it must have been reasonable for lawmakers to believe that the use of the challenged classification would promote that purpose. *Western & Southern Life Insurance Co. v. State Board of Equalization*, 451 U.S. 648, 668, 101 S.Ct. 2070, 2083, 68 L.Ed.2d 514 (1981). We readily conclude that the sentencing scheme in question withstands scrutiny under the rational basis standard. The fact that crack cocaine is more addictive, more dangerous, and can be sold in smaller quantities than powder cocaine is sufficient reason for Congress to provide harsher penalties for its possession. *United States v. Watson*, 953 F.2d 895, 898 (5th Cir.), cert. denied, — U.S. —, 112 S.Ct. 1989, 118 L.Ed.2d 586

(1992). See also *United States v. House*, 939 F.2d 659, 664 (8th Cir.1991); *United States v. Thomas*, 900 F.2d 37, 39 (4th Cir.1990); *United States v. Cyrus*, 890 F.2d 1245, 1248 (D.C.Cir.1989).³

AFFIRMED.



In re John R. FRITCH.

No. 91-1318.

United States Court of Appeals,
Federal Circuit.

Aug. 11, 1992.

United State Patent and Trademark Office, Board of Patent Appeals and Interferences agreed with examiner's conclusion that claimed invention for landscape edging apparatus and method was invalid based on obviousness. Applicant appealed. The Court of Appeals, Edward S. Smith, Senior Circuit Judge, held that fact that prior art could be modified in manner suggested by examiner did not make modification obvi-

ous. See also *United States v. Solomon*, 848 F.2d 156, 157 (11th Cir.1988) (no heightened scrutiny of mandatory minimum sentence for possession of cocaine base with intent to distribute because § 841(b)(1) does not discriminate on the basis of a suspect classification or a fundamental right).

1. King has presented no evidence to support his claim, although he points to statistics utilized by the Minnesota Supreme Court in *Minnesota v. Russell*, 477 N.W.2d 886 (Minn.1991). In that case, the trial court found that in 1988, 96.6% of all persons charged with possession of cocaine base in Minnesota were black, and that 79.6% of persons charged with possession of powder cocaine were white. For the purposes of argument, we will assume that the statistical data gathered in Minnesota is similar to that which would be found in this circuit.

2. The other circuits that have addressed this issue have applied the rational basis test. See *United States v. Watson*, 953 F.2d 895, 898 (5th Cir.), cert. denied, — U.S. —, 112 S.Ct. 1989, 118 L.Ed.2d 586 (1992); *United States v. House*, 939 F.2d 659, 664 (8th Cir.1991); *United States v. Thomas*, 900 F.2d 37, 39 (4th Cir.1990); *United States v. Cyrus*, 890 F.2d 1245, 1248 (D.C.Cir.

1989). See also *United States v. Solomon*, 848 F.2d 156, 157 (11th Cir.1988) (no heightened scrutiny of mandatory minimum sentence for possession of cocaine base with intent to distribute because § 841(b)(1) does not discriminate on the basis of a suspect classification or a fundamental right).

3. King also argues that the state and federal law enforcement agencies engaged in "de facto" sentencing, violating his right to due process. King contends that state criminal charges against him were dismissed in favor of prosecution in federal court, where the sentences for crimes involving crack cocaine are much harsher than in state court. King was charged with violations of both federal and state law. Because he could have been prosecuted in both state and federal court, we cannot conclude that his rights were violated because he was prosecuted only in federal rather than state court.

ous unless prior art suggested desirability of modification.

Reversed.

1. Patents \Leftarrow 32

In proceedings before Patent and Trademark Office, examiner bears burden of establishing prima facie case of obviousness based on upon prior art; patent applicant may then attack examiner's prima facie determination as improperly made out, or applicant may present objective evidence tending to support conclusion of nonobviousness. 35 U.S.C.A. § 103.

2. Patents \Leftarrow 16.4, 16.7

Claimed invention for landscape edging apparatus and method was not invalid based on obviousness; mere fact that prior art could be modified in manner suggested by examiner did not make modification obvious unless prior art suggested desirability of modification. 35 U.S.C.A. § 103.

3. Patents \Leftarrow 16(1)

It is impermissible to use claimed invention as instruction manual or "template" to piece together teachings of prior art so that claimed invention is rendered obvious and unpatentable. 35 U.S.C.A. § 103.

Charles L. Gholz, Oblon, Spivak, McClelland, Maier & Neustadt, Arlington, Va., argued, for appellant. John R. Fritch, Corpus Christi, Tex., was on the brief.

Jameson Lee, Associate Sol., Arlington, Va., argued, for appellee. With him on the brief was Fred E. McKelvey, Sol. Of counsel was Richard E. Schafer.

Before PLAGER, Circuit Judge, SMITH, Senior Circuit Judge, and RADER, Circuit Judge.

EDWARD S. SMITH, Senior Circuit Judge.

John R. Fritch (Fritch) appeals the 27 February 1991 decision of the Patent and

Trademark Office Board of Patent Appeals and Interferences (Board) affirming-in-part the Examiner's final rejection of the remaining claims in Fritch's application entitled Landscape Edging Apparatus and Method.¹ The Examiner concluded that Fritch's invention would have been obvious to one of ordinary skill in the art and was therefore unpatentable under 35 U.S.C. § 103. The Board, except for allowing claim 28, agreed. The Board's decision is reversed.

Issue

The issue is whether the Board erred in affirming the Examiner's determination that the prior art references of Wilson and Hendrix rendered the subject matter of Fritch's independent claims 1, 13, 24, and 29 obvious to one of ordinary skill in the art.

Background

In his final rejection, the Examiner rejected claims 1-24 and 27-30 of Fritch's application as unpatentable for obviousness under 35 U.S.C. § 103. Fritch appealed the final rejection to the Board. The Board affirmed the rejection as to claims 1-24, 29 and 30, entered a new ground of rejection for claim 27, and reversed as to claim 28. The Board agreed with the Examiner that the teachings of the Wilson and Hendrix patents rendered the subject matter of independent claims 1, 13, 24, and 29 obvious to one of ordinary skill in the art. Fritch does not appeal the Board's disposition as to claims 27 and 28, and at oral argument withdrew the appeal as to claim 8. The claims remaining in this appeal are 1-7, 9-24, 29 and 30.

The Fritch Invention

The invention claimed by Fritch involves a landscape edging device which includes a planar base portion and an upwardly extending retainer portion. The base portion is elongate, thin, flexible and has a planar bottom surface conformable to a varying slope ground surface. One longitudinal

1. Serial No. 06/838,721.

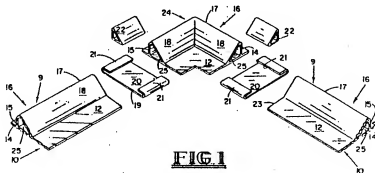
edge of the base portion serves as a mowing strip and the other serves as a retaining flange for landscape fill. The upwardly extending retainer portion is integrally connected (e.g., fused) to the base portion and defines a longitudinally extending enclosed space. The Fritch invention is intended to be used as a retainer for landscape fill in order to separate unmowable landscape fill from the mowable lawn. It may also be used to secure a landscaping sheet to the ground, or to function as guards at the base of a fence. Independent claims 1 and 13 on appeal are representative of the subject matter claimed:

1. A landscape edging strip formed in its entirety of a thin gauge, flexible material and conformable to a ground surface of varying slope, comprising a continuous elongate, thin gauge, flexible base portion having a planar bottom surface conformable to said varying slope ground surface; a thin gauge, elongate retainer portion integral with said base portion and extending upwardly therefrom and transversely thereover to overlie a portion of said base portion; all of said retainer portion defining a longitudinally extending enclosed space; said retainer portion being integrally connected to said base portion adjacent one longitudinal edge of said base portion to define a mowing strip adjacent the other longitudinal edge of said base portion.

13. A landscape edging strip formed in its entirety from thin gauge, flexible material and conformable to a ground surface of varying slope, comprising a continuous elongate, thin gauge, flexible base portion having a planar bottom surface conformable to said varying slope ground surface; a thin gauge, elongate retainer portion integral with said base portion and extending upwardly therefrom and transversely thereover to overlie a portion of said base portion; all of said retainer portion defining a longitudinally extending enclosed space; said retainer portion being integrally connected to said base portion at a transverse location between the longitudinal edges of said base portion, thereby defining a longitudinally extending retaining flange on one side of said retainer portion and a mowing strip on the other side of said retainer portion.

* * * * *

The critical language in Fritch's independent claims is that the device is to be, in its entirety, both flexible and "conformable to a ground surface of varying slope". These limitations, although located in the claims' preambles, "are necessary to give meaning to the claim[s] and properly define the invention".² Figure 1 from Fritch's drawings is reproduced below:



2. *Perkin Elmer Corp. v. Computervision Corp.*, 732 F.2d 888, 896, 221 USPQ 669, 675 (Fed.Cir.

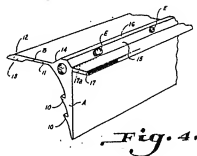
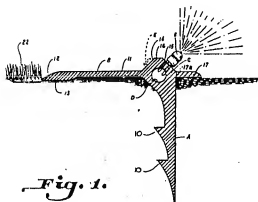
1984).

The Prior Art

a. The Wilson Patent

The Wilson patent relied upon by the Examiner and the Board is entitled "Grass Edging and Watering Device".³ The embodiment of the Wilson device includes a substantially flat mowing strip extending horizontally from a longitudinally extend-

ing body portion. Opposite the mowing strip is a scored flange which may be broken off when not needed or wanted. Between the mowing strip and the flange, and extending vertically from the body portion is an anchoring leg. Located above the anchoring leg is the body portion which contains a water conduit and sprinkler head assembly. The device is intended to be used adjacent to the borders of walks and plant beds. Figures 1 and 4 from Wilson's drawings are reproduced below:



b. The Hendrix Patent

The Hendrix patent is entitled "Loose Material Retainer Strip".⁴ The Solicitor chose not to discuss the Hendrix reference in his brief, stating that the Board had deemed Hendrix unnecessary to its decision. The Solicitor overstates the Board's position. The Board based its decision upon "a collective evaluation of the Wilson and Hendrix patents". We include Hendrix in our discussion because it did play a role in the rejection of Fritch's independent claims.

The Hendrix device is composed of elongated, flexible strips having substantially C-shaped cross-section. The bottom lip of the device is to be wider than the top lip in order to facilitate fastening the device to the ground. The device will fit most gentle contours, and the top lip will yield laterally to build-up of gravel until the gravel can be redistributed. The concave portion of the strip is installed such that it faces the material to be retained in place. Hendrix contemplates that the retainer will be used

3. U.S. Patent No. 3,485,449.

4. U.S. Patent No. 4,349,596.

in retaining gravel in driveways, lining flower beds, or on the shoulders of asphalt

or concrete highways. Figure 1 of Hendrix's drawings is reproduced below:

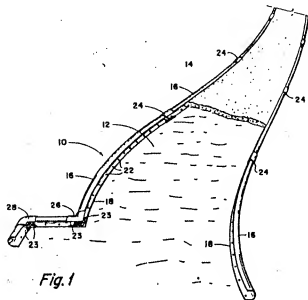


Fig. 1

Standard of Review

"[O]bviousness is a question of law to be determined from the facts."⁵ The obviousness determination "is based upon underlying factual inquiries concerning the claimed invention and the prior art" which are reviewed for clear error.⁶ However, it is the ultimate conclusion of obviousness which the Federal Circuit reviews as a matter of law.⁷

Teachings of Wilson

Fritch takes exception to the Examiner's findings of fact related to the teachings of the Wilson patent. The Examiner's rejection and the Board's opinion rely heavily on the use of Wilson in view of other references to declare the Fritch invention obvious. The Board states that it agrees with the Examiner's finding of fact regarding the

teachings of Wilson. In the Examiner's answer, which the Board quotes, the Wilson device is described as follows:

Wilson discloses a landscaping edging strip comprising a relatively thin gauge, elongated flexible base portion including a mower strip B having a planar bottom surface conformable to a varying slope surface.

The Board states that the Wilson reference presents "substantial evidence that Wilson is both thin and flexible." The Board regards the Wilson device as teaching that it is flexible and conformable in its entirety. This finding demonstrates clear error.

It is well settled that a prior art reference is relevant for all that it teaches to those of ordinary skill in the art.⁸ The base portion of Wilson is not planar in its

5. *In re De Blauwe*, 736 F.2d 699, 703, 222 USPQ 191, 195 (Fed.Cir.1984).

6. *In re Kulling*, 897 F.2d 1147, 1149, 14 USPQ2d 1056, 1057 (Fed.Cir.1990).

7. *In re De Blauwe*, 736 F.2d at 703, 222 USPQ at 195.

8. *Beckman Instruments Inc. v. LKB Produkter AB*, 892 F.2d 1547, 1551, 13 USPQ2d 1301, 1304 (Fed.Cir.1989).

entirety, as the Board's opinion suggests, but also includes a prominent anchoring leg to secure the device to the ground. The anchoring leg, which runs the length of the Wilson device, would inhibit longitudinal flexibility of the Wilson device. Indeed, Wilson expressly contemplates flexibility and conformability *only* in the mower strip. Wilson states that its mower strip may be lifted in order to pack dirt thereunder for the purpose of securing the device to the ground. Fritch, on the other hand, is claimed to be flexible in its entirety. The Board's holding that Wilson is flexible in its entirety is based upon a misapprehension of the scope of Wilson's teachings.

Second, Wilson's anchoring leg prohibits conformability to the ground surface in the manner claimed by Fritch. The Examiner's description of Wilson as having a "planar bottom surface conformable to a varying slope surface" is applicable *only* in reference to the mower strip. This description, however, ignores the anchor leg and the fact that it must be placed *into* the ground. Wilson expressly teaches that the anchoring leg may be pushed into soft soils, but in harder terrain a trench is needed in order to place the Wilson sprinkler system. In order to install the Wilson apparatus, the ground surface must be altered to conform to the device rather than, as the Solicitor contends, that Wilson is freely conformable to the ground. Fritch, on the other hand, does not require such extensive alteration of the ground surface in order to install the device.

Prima Facie Obviousness

[1] In proceedings before the Patent and Trademark Office, the Examiner bears the burden of establishing a prima facie case of obviousness based upon the prior art.⁹ "[The Examiner] can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in

the art would lead that individual to combine the relevant teachings of the references."¹⁰ The patent applicant may then attack the Examiner's prima facie determination as improperly made out, or the applicant may present objective evidence tending to support a conclusion of nonobviousness.¹¹

[2] Fritch has attacked the Board's finding that the Examiner established that Fritch's claimed invention was prima facie obvious in view of the teachings of the prior art. The Board states that "a collective evaluation of the Wilson and the Hendrix patents would have rendered the subject matter of independent claims 1, 13, 24, and 29 obvious to one of ordinary skill." Fritch maintains that there is no teaching, suggestion, or incentive in the prior art to modify or to combine the teachings of the prior art in the manner suggested by the Examiner. We agree.

Wilson teaches a grass edging and watering device which includes an anchoring leg for securing the device to the ground. Wilson contemplates that a trench will need to be dug in order to allow the anchoring leg to be placed into the ground if the condition of the soil requires it. This anchoring leg prohibits flexibility and conformability over the length of Wilson. Any flexibility or conformability in Wilson, which the Board states extends to the entire device, is limited to the mower strip. It is only the mower strip that is mentioned as being flexible in order to aid installation. Hendrix has been cited for its teaching of a flexible retainer strip that is able to conform to the ground surface.

Wilson addresses the problems of arresting growth of grass between areas and watering plants without wetting sidewalks. Wilson lacks any suggestion or incentive to use its water conduit as a landscape retainer since this would arguably result in clogged sprinkler heads.¹² Wilson also

9. *In re Piasecki*, 745 F.2d 1468, 1471-72, 223 USPQ 785, 787-88 (Fed.Cir.1984).

10. *In re Fitch*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed.Cir.1988) (citing *In re Lala*, 747 F.2d 703, 705, 223 USPQ 1257, 1258 (Fed.Cir. 1988)).

11. *In re Heldt*, 433 F.2d 808, 811, 167 USPQ 676, 678 (CCPA 1970).

12. This court has previously found a proposed modification inappropriate for an obviousness inquiry when the modification rendered the prior art reference inoperable for its intended pur-

teaches that its mower strip is flexible in order to allow dirt to be packed thereunder. There is no suggestion in Wilson to extend that flexibility to the entire device. Wilson also lacks any teaching or suggestion that one should remove the anchoring leg. Hendrix does not, simply by virtue of its flexible nature, suggest these extensive changes which the Board states are obvious. Neither Wilson nor Hendrix, alone or in combination, provide any incentive to combine the teachings of the prior art in the manner maintained by the Board.

"Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under section 103, teachings of references can be combined *only* if there is some suggestion or incentive to do so."¹³ Although couched in terms of combining teachings found in the prior art, the same inquiry must be carried out in the context of a purported obvious "modification" of the prior art. The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification.¹⁴ Wilson and Hendrix fail to suggest any motivation for, or desirability of, the changes espoused by the Examiner and endorsed by the Board.

[3] Here, the Examiner relied upon hindsight to arrive at the determination of obviousness. It is impermissible to use the claimed invention as an instruction manual or "template" to piece together the teachings of the prior art so that the claimed invention is rendered obvious.¹⁵ This court has previously stated that "[o]ne cannot use hindsight reconstruction to pick and choose among isolated disclosures in the

pose. *In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed.Cir.1984).

13. *ACS Hosp. Systems, Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir.1984).

14. *In re Gordon*, 733 F.2d at 902, 221 USPQ at 1127.

15. *In re Gorman*, 933 F.2d 982, 987, 18 USPQ2d 1885, 1888 (Fed.Cir.1991). See also *Interconnect*

prior art to deprecate the claimed invention." ¹⁶

Conclusion

The decision of the Board affirming the Examiner's rejection of independent claims 1, 13, 24, and 29 of Fritch's application as unpatentable over the prior art under 35 U.S.C. § 103 is reversed. Since dependent claims are nonobvious if the independent claims from which they depend are nonobvious, the Board's affirmation of the rejection of dependent claims 2-7, 9-12, 14-23, and 30 is also reversed.¹⁷

REVERSED.



The UNITED STATES,
Plaintiff-Appellee,

v.

COMMODITIES EXPORT CO.,
Defendant-Appellant,
and

Old Republic Insurance Co.,
Defendant-Appellant.

Nos. 91-1470, 91-1482.

United States Court of Appeals,
Federal Circuit.

Aug. 11, 1992.

Government brought action to recover unpaid liquidated damages under customs warehouse bond. The United States Court

Planning Corp. v. Fedl, 774 F.2d 1132, 1138, 227 USPQ 543, 547 (Fed.Cir.1985).

16. *In re Fing*, 837 F.2d at 1075, 5 USPQ2d at 1600.

17. *In re Fing*, 837 F.2d at 1076, 5 USPQ2d at 1600 (citing *Hartness Int'l, Inc. v. Simplimatic Eng'g Co.*, 819 F.2d 1100, 1108, 2 USPQ2d 1826, 1831 (Fed.Cir.1987)). See also *In re Sernaker*, 702 F.2d 989, 991, 217 USPQ 1, 3 (Fed.Cir.1983) (when argued together, dependent claims stand or fall with the independent claims from which they depend).

agency board is authorized to grant any relief that would be available to a litigant asserting a contract claim in the United States Claims Court." The argument is that because the United States Claims Court, as a successor to the Court of Claims, has jurisdiction over suits to recover bid preparation costs, the boards of contract appeals also have that jurisdiction.

The last sentence of section 8(d), however, does not define the kinds of contracts to which the Act applies. Section 3(a) defines the scope of the Act and, as we hold, it does not cover this type of contract. The second sentence of section 8 deals solely with the kind of relief a contract appeals board may give in a case within its jurisdiction. The provision cannot properly be considered as expanding the jurisdiction that section 3(a) gives the Board.

[6] B. In their complaint to the Board, the appellants also asserted that the Board had jurisdiction over their claim under Public Law No. 85-804, 50 U.S.C. §§ 1431-1435 (1976), which authorizes any agencies that "exercise[] functions in connection with the national defense . . . to enter into contracts or into amendments or modifications of contracts . . . whenever [the President] deems that such action would facilitate the national defense." *Id.* at § 1431. As noted, the Board held that the government's motion to dismiss on various grounds, including lack of jurisdiction over claims for bid preparation costs, was moot in view of its decision on the merits.

In light of the Board's action, we cannot tell upon which statute the Board based its jurisdiction. Since the appellants' major emphasis before this court on the jurisdictional issue has been the Contract Disputes Act, and since appellants have not shown that the requirements of Public Law No. 85-804 have been met, we assume that the Board acted pursuant to the Contract Disputes Act. If that conclusion is erroneous, it would make no difference to the appellants since any action or decision by an agency under Public Law No. 85-804 is within the exclusive discretion of the executive branch of the government and is not

subject to judicial review. See *Winder Aircraft Co. v. United States*, 412 F.2d 1270, 188 Ct.Cl. 799 (1969); *Evans Reamer & Mach. Co. v. United States*, 386 F.2d 873, 181 Ct.Cl. 539 (1967); *Bolinders Co. v. United States*, 153 F.Supp. 381, 139 Ct.Cl. 677 (1957).

The decision of the Department of Energy Board of Contract Appeals denying the appellants' claim for bid preparation costs is vacated.

VACATED.



In re Robert K. GRASELLI and Harley
F. Hardman, Appellants,
and

Rohm and Haas Company, Intervenor.

Appeal No. 83-504.

United States Court of Appeals,
Federal Circuit.

July 15, 1983.

Appeal was taken from a decision of the United States Patent and Trademark Office Board of Appeals which affirmed the final rejections of all claims of a reissue application Serial No. 713,024 seeking reissuance of patent No. 3,642,930 which was directed to catalysts containing an alkali metal as an essential catalytic ingredient. The Court of Appeals, Nies, Circuit Judge, held that rejections for obviousness of claims 15 and 19-32 of a reissue application were improper and rejections of claims 1-14, 16-18, 33 and 34 for obviousness were proper.

Affirmed in part and reversed in part.

1. Patents \Leftrightarrow 16.25

Rejections for obviousness of claims 15 and 19-32 of a reissue application for patent No. 3,642,930, which was directed to catalysts containing an alkali metal as an essential analytic ingredient, were improper and rejections of claims 1-14, 16-18, 33 and 34 for obviousness was proper. 35 U.S.C.A. § 103.

2. Patents \Leftrightarrow 16.13

Issue of inherency is a question of fact.

3. Patents \Leftrightarrow 36(1)

Objective evidence of nonobviousness must be commensurate in scope with the claims which the evidence is offered to support. 35 U.S.C.A. § 103.

Ford F. Farabow, Jr., Washington, D.C., argued, for appellants; David W. Hill, Cleveland, Ohio, on brief; Herbert D. Knudsen and David J. Untener, Cleveland, Ohio, of counsel.

Dale H. Hoscheit, Washington, D.C., argued, for intervenor; George W.F. Simmons, Philadelphia, Pa., of counsel.

Gerald H. Bjorge, Arlington, Va., argued, for appellee; Joseph F. Nakamura, Sol., and Fred E. McKelvey, Associate Sol., Washington, D.C., on brief.

Before BENNETT, SMITH and NIES, Circuit Judges.

NIES, Circuit Judge.

This appeal is from the decision of the United States Patent and Trademark Office (PTO) Board of Appeals (board) affirming the final rejections under 35 U.S.C. § 103 (1976) of claims 1-34, all of the claims of reissue application serial No. 713,024 filed August 9, 1976. We reverse with respect to claims 15 and 19-32 and affirm the board's decision with respect to all other claims.

I

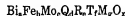
The original patent sought to be reissued here, U.S. Patent No. 3,642,930 (issued on February 15, 1972, to Standard Oil Compa-

ny, Cleveland, Ohio), is directed to catalysts containing an alkali metal as an essential catalytic ingredient. As claimed, the catalyst composition must contain, in addition to the alkali metal, bismuth, iron and molybdenum in oxide form.¹ Such alkali metal catalyst compositions are asserted, in the patent, to be an improvement over prior art catalysts in that they are particularly suited to the catalytic oxydehydrogenation of isoamylenes, methyl butanols, or mixtures thereof to isoprene.

By this reissue application under 35 U.S.C. § 251 (1976), inventors Grasselli and Hardman (hereafter appellants) have presented claims additional to those of the patent: claims directed to catalysts requiring the essential alkali metal component to be potassium, cesium, or rubidium; claims requiring inclusion of preferred additives, and claims requiring activation of the catalyst at 500°F, and up to 1250°F.

Specifically, the subject application for reissue sets forth claims to a catalyst composition in claims 6-34, and to a process for catalytic isoprene production in claims 1-5. Claims illustrative of that process and catalyst composition are set forth below:

1. The process for the conversion of isoamylenes, methyl butanols or mixture thereof to isoprene comprising contacting said isoamylenes, methyl butanols or mixtures thereof with a molecular oxygen-containing gas over a catalyst consisting essentially of an activated catalytic oxide complex described by the following formula:



wherein Q is an alkali metal,

R is an alkaline earth metal,
T is phosphorus, arsenic or antimony,

M is cobalt and/or nickel, and
wherein a, b and c are numbers in the range of

0.1 to 12,

d is a number from 0.1 to 8,

e is a number from 0 to 8,

referred to as a four-component catalyst.

1. In the discussion below, this base catalyst is

f is a number from 0 to 6,
 g is a number from 0 to 12, and
 x is a number determined by the
 valence requirements of the other
 elements present,

in a reaction zone maintained at from
 about 500°F. to about 1100°F. at from
 about 0.5 to about 10 atmospheres pressure
 with a contact time of from about
 0.01 second to 50 seconds, and recovering
 the isoprene.

6. A catalyst composition consisting
 essentially of an activated catalytic oxide
 complex of an alkali metal, bismuth, iron
 and molybdenum as essential catalytic
 ingredients, and defined by the following
 formula:



wherein Q is an alkali metal,

R is an alkaline earth metal,
 T is phosphorus, arsenic or antimony,

M is cobalt and/or nickel, and

wherein a, b and c are numbers in the
 range of 0.1 to 12,

d is a number from 0.1 to 8,

e is a number from 0 to 8,

f is a number from 0 to 6,

g is a number from 0 to 12, and

x is a number determined by the
 valence requirements of the other
 elements present.

7. The composition of claim 6 wherein
 Q is potassium.

14. The composition of claim 7 wherein
 M is cobalt and wherein activation of
 the catalytic oxide complex is conducted
 at 500°F to 1250°F in the presence of an
 atmosphere consisting essentially of air.

15. The composition of claim 6 wherein
 Q is potassium and M is cobalt, and
 wherein e equals 0, f equals 0 and g is a
 number larger than 0.

2. The Rohm and Haas motion to intervene here
 was granted in view of Rohm and Haas's status
 as a proctor in these reissue proceedings and
 because the catalyst that Rohm and Haas uses
 for the oxidation of propylene to acrolein (a
 catalytic oxidation of an olefin to an unsaturated
 aldehyde) was accused in an International
 Trade Commission ("ITC") proceeding of in-

fringing the composition of claim 7 wherein
 activation of the catalytic oxide complex
 is conducted at 500°F in the presence
 of an atmosphere consisting essentially
 of air.

19. The composition of claim 6 wherein
 Q is cesium.

26. The composition of claim 6 wherein
 Q is rubidium.

As can be seen from the above, the preferred
 alkali metals, potassium, cesium, and
 rubidium, are recited in claims 7, 19 and 26.
 Claims 14 and 17 recite the temperature at
 which the catalyst compositions can be activated.
 Catalyst composition claims, depending
 from claims 6, 7, 19 and 26, refer to
 inclusions of optional components expressly
 recited in claim 6, specifically phosphorus
 (claims 8, 23 and 30); cobalt (claims 9, 14,
 15, 21, 28, 34); nickel (claims 10, 13, 20, 27,
 33); mixtures of cobalt and nickel (claim
 12); antimony (claims 16, 24, 29) and arsenic
 (claims 22, 31). Other claims depending
 from claims 7, 19 and 26 specify that the
 catalyst is supported on silica (claims 18, 25
 and 32).

II

Notwithstanding its expedited case status,
 the instant reissue application has been
 pending for seven years. The many issues,
 considered in this appeal, are in part attributable
 to the efforts of Rohm and Haas who
 vigorously protested this reissue, by
 appearance during ex parte prosecution, by
 briefing and oral arguments before the
 board, and here as an intervenor.²

These reissue proceedings have twice
 been appealed to the board. Consequently,
 two decisions by the board are being
 reviewed here. As a result of both decisions,
 there are twelve separate grounds of rejection
 of the claims, all under 35 U.S.C.
 § 103,³ which were affirmed by the board
 and are the subject of this appeal.

fringing the Grasselli and Hardman catalyst
 claims. See *Rohm & Haas v. ITC*, 554 F.2d
 462, 193 USPQ 693 (CCPA 1977). The ITC
 proceedings were terminated at Standard Oil's
 behest prior to a determination on the merits,
 following which Standard Oil sought reissue.

3. § 103 provides:

During the first appeal, the board affirmed the examiner's final rejections, based on the following four references which disclose alkali metals, or compounds thereof, in catalysis processes.

Japanese Patent Publication No. 41-11847/1966, June 29, 1966	
U.S. Patent No. 3,205,280—Wattimena et al.	(Japanese Patent)
U.S. Patent No. 3,621,072—Watanabe et al.	(U.S. Wattimena)
U.S. Patent No. 3,415,888—McClellan	(Watanabe)
	(McClellan)

The Japanese Patent Publication No. 41-11847/1966 (Japanese Patent) was cited as a "new ground" of rejection in the examiner's answer in the first appeal to the board as a result of five affidavits, filed by Rohm and Haas, apparently purporting to show that Example 4 of the Japanese Patent produced a product within appellants' claims.

§ 103. Conditions for patentability; non-obvious subject matter

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. § 1.196(b) provides:

(b) Should the Board of Appeals have knowledge of any grounds not involved in the appeal for rejecting any appealed claim, it may include in the decision a statement to that effect with its reasons for so holding, which statement shall constitute a rejection of the claims. The appellant may submit an appropriate amendment of the claims so rejected or a showing of facts, or both, and have the matter reconsidered by the primary examiner. The statement shall be binding upon the primary examiner unless an amendment or showing of facts not previously of record be made which, in the opinion of the primary examiner, avoids the additional ground for rejection stated in the decision. The appellant may waive such reconsideration before the primary examiner and have the case reconsidered by the Board of Appeals upon the same record before them. Where request for such reconsideration is made the Board of

The examiner did not make the additional rejections based on other prior art references as suggested by Rohm and Haas.

However, in the board's first decision, pursuant to its authority under 37 C.F.R. §§ 1.196(b) and 1.196(d) (Rules 196(b) and 196(d)),⁴ the board did entertain Rohm and Haas's suggestions to make those additional rejections on the following references:

- U.S. Patent No. 3,226,422—Sennewald et al.
- U.S. Patent No. 3,846,617—Hiroki et al.
- U.S. Patent No. 3,414,631—Grasselli et al. (Grasselli '631)
- U.S. Patent No. 3,454,630—Yamaguchi et al.
- British Patent 973,565—Wattimena et al. (British Patent)

Specifically, the board's first decision contained a recommendation to the examiner,

Appeals shall, if necessary, render a new decision which shall include all grounds upon which a patent is refused. The appellant may waive reconsideration by the Board of Appeals and treat the decision, including the added grounds for rejection given by the Board of Appeals, as a final decision in the case.

§ 1.196(d) provides:

(d) Although the Board of Appeals normally will confine its decision to a review of rejections made by the primary examiner, should it have knowledge of any grounds for rejecting any allowed claim that it believes should be considered, it may include in its decision a statement to that effect and remand the case to the primary examiner for consideration thereof. In such event, the Board shall set a period, not less than one month, within which the appellant may submit to the primary examiner an appropriate amendment, or a showing of facts or reasons, or both, in order to avoid the grounds set forth in the statement of the Board of Appeals. If the primary examiner rejects the previously allowed claim or claims on the basis of such statement, the appellant may appeal to the Board of Appeals from the rejection. Whenever a decision of the Board of Appeals includes a remand, that decision shall not be considered as a final decision in the case, but the Board of Appeals shall, upon conclusion of the proceedings before the primary examiner on remand, either adopt its decision as final or render a new decision on all of the claims on appeal, as it may deem appropriate.

in accordance with Rule 196(d), to reconsider the examiner's allowance of certain claims in view of the above references. After remand of the case to the examiner, and during prosecution before him, various declarations and affidavits were presented by both Rohm and Haas and appellants. Relying on 37 C.F.R. § 1.198,⁵ the examiner refused to consider appellants' declarations and affidavits, after having specifically been entered by petition to the Commissioner, on the ground that the experiments therein related only to rejections affirmed by the board in its first decision.

Since the board's second decision is expressly limited to consideration of the rejections originally proposed by the board under Rules 196(b) and 196(d), the board apparently adopted, at least in part, the examiner's reasoning for refusing to consider appellants' affidavits and declarations filed during the remand period.

As a result of the subsequent prosecution and the board's second decision, all of appellants' claims (original as well as new claims) stand rejected under 35 U.S.C. § 103. Specifically, the following grounds apply:

Claims	References
1-7, 11, 19, 26, 28, 32	U.S. Wattmense
11, 16, 19, 23-26, 29, 30, 32	Watanabe
1-16, 18-21, 23, 25-28, 30, 32-34	McClellan
6, 7, 11-15, 18-21, 23-28, 32-34	Japanese Patent
12-15, 18, 20, 21, 27, 28, 33, 34	U.S. Wattmense taken with the British Patent
16, 24, 29	McClellan taken with Grasselli '631
16, 24, 29	Japanese Patent
6-8, 11, 16, 19, 23-26, 29, 30, 32	Sonnenwald et al. in combination with Hiroki et al.
5, 9-13, 15-16, 18-34	Yamaguchi et al. or Grasselli '631 taken with Watanabe
17, 22, 31	Sonnenwald et al. in combination with Hiroki et al.

5. § 1.198 provides:

Cases which have been decided by the Board of Appeals will not be reopened or reconsidered by the primary examiner except under the provisions of § 1.196 without the written authority of the Commissioner, and then only for the consideration of matters not

Claims

22, 31

17, 22, 31

References

Grasselli '631 in view of Watanabe and appellants' admissions.

McClellan in view of Grasselli '631.

III

[1] To set the context of the issues here, it is emphasized that all rejections made by the PTO are under 35 U.S.C. § 103. No written description of a catalyst embraced by the appealed claims appears in the prior art applied in the various rejections. *In re Marshall*, 578 F.2d 301, 198 USPQ 344 (CCPA 1978); *In re Arkley*, 455 F.2d 586, 172 USPQ 524 (CCPA 1972). However, Rohm and Haas put forth a theory of inherency, normally the basis for rejection under 35 U.S.C. § 102, that the board apparently adopted.

In any event, the issues here relate to the determination of obviousness, or nonobviousness, of claims directed to a catalyst composition with four essential components: bismuth, iron, molybdenum and an alkali metal, as well as to claims of a method using that catalyst.

Appellants take the position that none of the rejected claims would have been *prima facie* obvious from the prior art. In essence, appellants argue that catalysis is unpredictable and that the board has equated very different catalysts and very different reactions with those of appellants to support the rejections.

Alternatively, if the claims appear to have been *prima facie* obvious, appellants argue that rebuttal evidence of record negates this conclusion. Primarily, appellants rely on Friedrich I, Friedrich II, Friedrich III and Friedrich IV declarations, although other declarations (and affidavits) were filed on behalf of appellants corroborating, supporting, or adding to information set forth in the four Friedrich declarations.⁶ Specifically, appellants ask this court to

already adjudicated, sufficient cause being shown.

6. These are by Baldwin, Strecker, Callahan and Grasselli et al. Rohm and Haas, too, has filed various declarations and affidavits. These are by Kennelly, De Jong, Lade, Bauer and Nemec.

consider, although the board did not, the experiments and evidence of Friedrich III and IV with respect to rejections affirmed by the board in its first decision.

IV

The examiner held that appellants' claimed catalyst and method of use would have been obvious on the basis of teachings in any one of the following references: Japanese Patent; U.S. Wattimena, Watanabe, or McClellan. These four references were asserted as four separate grounds of rejection which were the subject of the first appeal. As the PTO treated these four references as the references most material to the issue of patentability of all of the rejected claims, they will be considered first; for analysis, we find it convenient to discuss them starting with Watanabe.

A

Watanabe (U.S. Patent No. 3,621,072)

Appellants argue, and we agree, that the board erred in holding that any of appellants' claims would have been obvious from the teachings of Watanabe.⁷

Watanabe describes a catalytic conversion of a mixed gas of isobutylene, methanol and/or ethyl ether to isoprene. The catalyst used by Watanabe is described to be at least one oxide of tungsten, vanadium, molybdenum, uranium, copper, iron, and chromium. Various Watanabe examples employ as the catalyst one oxide of the aforementioned elements; one of the examples employs as a catalyst a mixed oxide system of molybdenum-vanadium-uranium-tungsten.

In the board's view Watanabe is pertinent under 35 U.S.C. § 103 for the sole reason that:

7. Although appellants had argued in the first appeal, and do here, that Watanabe "falls short of establishing a *prima facie* case of obviousness," appellants filed a declaration under 37 C.F.R. § 1.131 "in order to simplify the issues on appeal," during the remand period between the first and second appeals to the board. In the board's second decision, the board reversed the rejections of certain claims over Watanabe, finding the declaration sufficient to antedate

We note the explicit suggestion by these patentees to add compounds of *alkali metals such as sodium or potassium* to the catalysts, to increase isoprene selectivity. [Emphasis added.]

Watanabe describes the addition of promoters to the catalyst, to inhibit side reactions and increase product selectivity. These promoters are described to be compounds of phosphorus, sulfur, boron, antimony, bismuth, tellurium, silver, barium, calcium, magnesium, potassium and sodium. Of the 22 Watanabe examples, 10 describe the use of promoters. None of the specific examples relies on the use of sodium or potassium as a promoter.

The "promoted catalysts" actually described therein—oxides of the following systems: uranium-antimony; tungsten-tellurium; molybdenum-phosphorus; molybdenum-sulfur; vanadium-sulfur; molybdenum-bismuth-phosphorus and calcium-bismuth-molybdenum-phosphorus — differ significantly from the subject compositions. Even if sodium or potassium were substituted, in any one of the exemplified "promoted" catalysts, for the identified promoter(s), and were operative therein, any composition thus created is deficient in at least one element of appellants' catalyst and there is no objective basis to add the missing element(s) to create the composition as claimed. Thus, appellants' catalyst composition cannot be held to have been obvious from Watanabe alone.

B

Wattimena (U.S. Patent No. 3,205,280)

U.S. Wattimena describes butene production by dehydrogenating butane in the presence of a halogen, oxygen and a solid catalyst.⁸

the reference with respect to those claims. As the Watanabe reference does not establish a *prima facie* case of obviousness, we need not treat the remaining issues arising under 37 C.F.R. § 1.131.

8. Although it appears from the discussion above, in section II, that U.S. Wattimena and the British Patent (British Patent No. 973,565 to Wattimena) are used in two different

According to U.S. Wattimena, the solid catalyst must contain "one or more alkali metal and/or alkaline-earth metal compounds"; and the preferred catalysts are reported to be those composed of potassium bromide, silver bromide and didymium chloride, on a support. U.S. Wattimena broadly suggests enhanced activity of the basic catalyst on "addition" of "one or more metal compounds derived from the transition elements of Groups I and IV to VIII of the Periodic Table and/or a rare-earth metal compound," such as the elements: zirconium, titanium, vanadium, chromium, molybdenum, manganese, tungsten, iron, cobalt, nickel, palladium, copper, silver and compounds thereof.

The rejections under 35 U.S.C. § 103 over Wattimena are based on the following description:

A suitable *solid catalyst (plus carrier)* for the dehydrogenation of butene to butadiene has the following composition (in parts by weight): Al_2O_3 90.2; SiO_2 9.0; Fe 2O_3 0.2; MgO 0.1; CaO 0.1; Na_2O 0.1; K_2O 0.1; and TiO_2 0.1. A catalyst which was successfully used in the dehydrogenation of n-butane contained, in addition, 1.7 "didymium oxide." 0.6 Na_2O , and 1.4 MoO_3 , the latter compounds as Na-molybdate. In another similar case, the additional compounds consisted of 11.4 Bi_2O_3 and 7.0 MoO_3 parts by weight. Excellent results were also obtained with a solid catalyst consisting of 100 SiO_2 ; 19.9 "didymium oxide"; 17.1 MoO_3 and 3.7 Na_2O parts by weight.

U.S. Wattimena, col. 4, lines 38-49 (emphasis added).

grounds of rejection, this is not the case. The examiner and the board treated the British Patent to be cumulative to U.S. Wattimena. For purposes here, we will agree with the examiner and the board, in a way as adverse to appellants as possible, that the British Patent confirms the intention of U.S. Wattimena to disclose bismuth as a potential catalytic component.

9. Declarations filed by Friedrich (Friedrich I) and Strecker on appellants' behalf have been considered. These declarations attempt to

As framed by the parties, the issue posed by Wattimena resides in an *interpretation* of the description of the first composition of eight components (Al_2O_3 , SiO_2 , Fe_2O_3 , MgO , CaO , Na_2O , K_2O and TiO_2), particularly in light of the language "solid catalyst (plus carrier)." Two extremely divergent views in interpreting this description have been argued.

On the one hand, it is argued that appellants' catalyst, for example as in claim 6, would have been obvious from the *whole* of the above excerpt from Wattimena inasmuch as the four components of appellants' catalyst would be found together if Bi_2O_3 and MoO_3 are added as suggested in the third sentence of the above excerpt, (albeit as a ten-component composition);⁹ however, it is noted, the excerpt fails as a direct anticipation because, *inter alia*, the eight-component composition contains TiO_2 , described as a catalytic component by U.S. Wattimena but not recited in appellants' claims as a catalytic component.

On the other hand, appellants argue that the eight-component composition described in the excerpt above must be construed as constituting a *carrier*. To buttress this argument, appellants rely on information in brochures, as well as other evidence in the record of this appeal, which shows that Norton alpha aluminas (catalyst carriers) comprise each of the eight components (Al_2O_3 , SiO_2 , Fe_2O_3 , MgO , CaO , Na_2O , K_2O and TiO_2) in substantially similar, though not identical, proportions to the eight-component composition in the Wattimena description excerpted above and relied upon by the

show that the written description fails to produce appellants' catalyst and pertains to X-ray study comparisons of the eight-component composition, described in Wattimena, excerpted above, and of the composition resulting from the addition of Bi_2O_3 and MoO_3 to that eight-component composition. These declarations are not considered to be dispositive of the issue attempted to be proven, as there is, *inter alia*, no X-ray study of a four-component catalyst, of, for example, appealed claim 6, in the study.

PTO in the rejections under 35 U.S.C. § 103.¹⁰

In our view, the effect of this information concerning the composition of the Norton alpha-alumina carrier is not to interpret what was intended by Wattimena's description, but to shift the burden of going forward to the PTO. It then became incumbent on the PTO to show that Wattimena itself would suggest adding two components and selecting out at least the four essential components of appellants' catalyst, or that there was some reasonable basis in the prior art to make the selection claimed here. See *In re Sasse*, 629 F.2d 675, 681, 207 USPQ 107, 111-12 (CCPA 1980). The PTO failed to counter appellants' showing and, accordingly, we do not sustain claim rejections based on U.S. Wattimena.

C

The Japanese Patent Publication 41-11847 (Japanese Patent)

The Japanese Patent is directed to improving the selectivity of a known process for producing propylene oxide (the epoxide) by decreasing isomerization reactions which result in the by-product propionaldehyde. This improvement is achieved by modification of process conditions but does not rely on use of any particular catalyst system.

In fact, the Japanese Patent suggests no critically as to the catalyst composition: That is, the Japanese Patent indicates that any "metal and/or metallic oxide system" based on "copper, silver, molybdenum, bismuth, vanadium, antimony, tungsten, cobalt, nickel, manganese, chromium, tin, selenium, or iron" may constitute the catalyst. Catalysts used in Examples 1-3 and 5-12 vary widely in composition, for example,

from silver or silver oxide alone to systems including copper, tin, and selenium.

The contribution of the Japanese Patent, the modification of the propylene oxide production process conditions to improve selectivity, requires both inclusion of a peroxide or a peroxide source in the feed stream of propylene and oxygen and addition of a *basic organic or inorganic substance* (hereinafter "basic modifier") to an "ordinary" oxidation catalyst of a metal and/or metallic oxide system. The basic modifier is broadly described as organic or inorganic, solid or liquid, either a strong base or a weak base. In the examples, triethanol amine, 2,3,4-trimethyl pyridine, sodium carbonate, sodium hydroxide and potassium hydroxide are used as the source of the basic modifier.¹¹

Within the confines of the patent, a number of examples of the improved process are given. But for Example 4 the entire disclosure is otherwise of no interest.

In Example 4, the first stage in the process requires admixing potassium hydroxide (as the source of the modifier) with stearic acid containing a calcined mixture of the salts of bismuth, iron and molybdenum. The pertinent portion of Example 4 reads:

Example 4:

110 gm of ammonium molybdate was dissolved in 150 cc of hot water. Separately a dispersion of 150 gm of bismuth nitrate and 50 gm of ferric nitrate in 100 cc of 1N nitric acid solution was prepared. The solutions were mixed to form a milky brown precipitate. The precipitate was dried at 110°C, crushed, 1% by weight of stearic acid added and molded to circular tablets 5 mm diameter × 5 mm, then calcined at 400°C for 16 hours. The cata-

The Baldwin declaration confirms the fact that Norton alpha aluminas (for example, Norton SA 105) predate the application filing date of the original patent sought to be reissued; none of the arguments here dispute that fact.

10. The evidence, brochures and other information, includes an April 4, 1977, letter from James D. Ball of Norton Company Chemical Process Products Division; a typical chemical analysis of the SA-5105 (SA-105) catalyst carrier, a Norton alpha-alumina; Bulletin CC-10 entitled "Catalyst Carrier" (1974); a chemical analysis sheet for SA-5205, augmenting information in Bulletin CC-10; and a comparison of the old product, the then current (1977) product and the product sent to Standard Oil Company.

11. Significantly, the Japanese Patent does not describe "alkali metal(s)" either in conjunction with the description of the catalyst or in conjunction with the basic modifier.

lyst thus obtained is referred [to] as Catalyst-C (comparative example).

15 cc of 1N potassium hydroxide solution was added to the Catalyst C and the product obtained by drying it at 120°C is referred [to] as Catalyst D (example of this invention).

It is apparent that no written description of the claimed compositions is given in Japanese Patent Example 4 and the board refused to hold the Japanese Patent to be a direct anticipation. *In re Arkley*, 455 F.2d 586, 172 USPQ 524 (CCPA 1972). Without explanatory comment, the board, nevertheless, adopted the examiner's reasons for affirmation of the § 103 rejections based not on any interpretation of the prior art embodied by the Japanese Patent, but on extraneous evidence in the form of affidavits filed by Rohm and Haas during the examination of the subject reissue application in support of its assertion that appellants' catalyst was anticipated by Japanese Patent Example 4, a position it urged before the board.

It is fundamental that rejections under 35 U.S.C. § 103 must be based on evidence comprehended by the language of that section. *In re McKellin*, 529 F.2d 1324, 1329, 188 USPQ 428, 433 (CCPA 1976). We consider the affidavits not because of their competency as prior art but rather because of the inferences of inherency which underlie the PTO's § 103 rejections based on the Japanese Patent and which are not consistent with the description of the Japanese Patent, set forth above. If the affidavits fail to show that Japanese Patent Example 4 produces a composition within the rejected claims, *a fortiori*, they evidence nothing relevant to the patentability of the rejected claims.

Inherency would be established either if the portion of Example 4 excerpted above produces the four-component catalyst; or if the Example 4 catalyst is converted to the

four-component catalyst when it is subjected to temperatures of propylene oxide production described in other portions of Example 4.

[2] The issue of inherency is a question of fact. *In re Pracalossi*, 681 F.2d 792, 794, 215 USPQ 669, 671 (CCPA 1982). Five affidavits, apparently presented by Rohm and Haas to support the above two arguments, fail to establish such critical facts. The affidavits state that a reaction product is formed (by a test with pH paper) when the potassium hydroxide is added to the stearic acid containing the calcined mixture of salts of bismuth, iron, and molybdenum when the synthesis of Japanese Patent Example 4 is followed, and that the potassium content of that reaction product remains substantially constant, whether it is merely dried at 120°F or subsequently heated at 340°C, or heated to 427°C, and then to 538°C. However, there is no evidence that that reaction product is one embraced by claims 6 and 7. Specifically, there is no evidence of record which shows that that reaction product includes potassium in the potassium oxide form.¹² If appellants' catalyst is inherent in the Japanese Patent, it has not been established by the record here and obviousness cannot be predicated on that which is unknown. Thus, we reverse the board's rejection on the Japanese Patent.

D

McClellan, U.S. Patent No. 3,415,886

McClellan, U.S. Patent No. 3,415,886, is directed to bismuth molybdate-, or phosphobismuth molybdate- (bismuth molybdate), on silica catalysts heat treated to temperatures of 750° to 850°C to convert crystalline bismuth molybdate to an amorphous phase. Heat treatment to achieve this result may be undertaken in two stages, first at a temperature of 400 to 500°C and then at a

of appellants' four-component catalyst differs substantially from that produced by the Japanese Patent Example 4 and that activity is independent of amounts of potassium hydroxide used.

12. Moreover, the evidence in Friedrich II and Friedrich III comparing the catalyst of the Japanese Patent Example 4 to appellants' four-component catalyst, containing potassium as the essential alkali metal, shows that under certain catalytic reaction conditions the activity

temperature of 750 to 850°C. These catalysts are described to be useful in oxydative dehydrogenation, in propylene ammoxidation and isoprene production.

The significance of McClellan resides in its additional descriptions, relating to the presence of alkali metal in the catalyst and to the enhancement of catalytic activity by inclusion of promoters such as iron. Appellants argue, however, that McClellan actually teaches away from inclusion of alkali metal in the catalyst and, that as to promoters, McClellan contains merely a "shot-gun" description of many elements for such use, which would not lead a person of ordinary skill to select the elements appellants require.

With respect to alkali metal inclusion, McClellan suggests that sodium and/or potassium may *contaminate* the McClellan heat treated catalyst if reactants containing sodium or potassium are employed, as a source of the molybdate, or if the silica sol used as the essential silica carrier contains either or both:

Molybdenum oxide is usually obtained from aqueous ammonium molybdate; however, alkali molybdates can be used. When alkali molybdates such as sodium or potassium molybdate are used, sodium or potassium ion, which is difficult to eliminate completely, must be acceptable in the final catalyst. An atomic Na:Mo ratio of 1:4 must not be exceeded in order to maintain good directivity in the catalyst. After processing in the manner described in this invention, heat-treated compositions containing sodium or other alkali or alkaline earth metals in the acceptable metal/molybdenum ratio of 1:4 or less give X-ray evidence of the presence of the scheelite structure of crystalline $Mx_{1/2}BiMoO_3$, where x = valence of alkaline earth or alkali metal M. In view

of the desirability of low sodium and potassium content in most catalysts, ammonium molybdate is a preferred source of the molybdenum component of the catalyst.

* * * * *

The catalyst of the invention involves use of silica as a support, and the silica must be added as colloidal silica, i.e., an aqueous silica sol (silica sols generally contain about 80-40% silica). The silica can be present in the final catalyst in any amount less than 90% and greater than 5%, but it is preferred that the catalyst contain about 27-75% by weight of silica. Certain commercial silica sols contain small amounts of sodium (e.g., one commercially available product of 30% SiO_2 content contains 0.3% Na_2O as titratable alkali), but, as previously discussed, low levels of sodium appear to have no serious effect on the catalysts of this invention. When these commercial silica sols are used, the catalytic composition can have the following formula:



Where a is 4, b is 0 to 2, c is 24 to 160, d is $1.5a + 2.5b + 36 + 2c + 0.5e$ and e is 0 to 3.

McClellan, col. 3, lines 1-65.

Although McClellan does indicate that sodium and/or potassium can adversely affect the "directivity" of catalysts, as well as methods for insuring the absence of alkali metal, McClellan's catalyst will tolerate sodium and/or potassium contamination to a specified extent. Moreover, Example 1 of the reference describes, as a result of McClellan's heat treatment (at 750°C), an amorphous scheelite $NaBiMoO_3$ catalyst.¹³ McClellan describes sodium or potassium in a bismuth molybdate catalyst and the effi-

13. Appellants argue that the language "activated catalytic oxide complex" in claims 1 and 6 and the language in claims 17 and 14 specifying temperatures of 500°F and 500 to 1250°F, respectively, as temperature of catalyst activation, serve as patentable distinction over McClellan which requires an ultimate calcination temperature of 750°-850°C. However, McClellan does indicate that the first stage of a

two-stage calcination treatment may be undertaken at lower temperatures, 400° to 500°C, which can produce a catalyst, though a conventional one, and not McClellan's amorphous catalyst resulting from higher heat treatment, i.e., 750° to 850°C. McClellan does not state that sodium or potassium contamination of bismuth molybdate will not occur at 400-500°C.

cacy of the resulting composition for its intended use as a catalyst. The only missing ingredient is iron which, however, McClellan supplies.

To enhance catalytic activity, McClellan enumerates iron, nickel, or cobalt, as well as various other elements, as promoters. Appellants argue that many elements are enumerated as promoters and that no specific promoted catalyst is described in McClellan. However, McClellan specifically indicates that addition of the promoters, iron, for example, (as well as "cobalt and nickel," recited in other claims) will enhance catalytic activity. Moreover, McClellan specifically describes how to apply these promoters:

These promoters are usually applied by impregnation or surface coating of already formed bismuth molybdate of phosphomolybdate-on-silica catalysts. Thus, the metals can be added to the slurried catalyst as a salt or acid or the metal, e.g., as a compound which is thermally decomposable in situ to form the desired promoter. After the catalyst has been impregnated with such solutions, employed in concentrations adequate to provide the desired amount of material, the impregnated catalyst may be dried and calcined at any desired temperature.

McClellan, col. 5, lines 2-11 (emphasis added).

The descriptions of McClellan directed to adding iron, nickel and cobalt as promoters, how to make that addition, and the effect of that addition, once made, suggest a predictably operative result, a successful addition of those elements to McClellan's catalyst. *In re Mercier*, 615 F.2d 1161, 185 USPQ 774 (CCPA 1975).

In view of the McClellan description concerning the addition of iron as a promoter and the express statement concerning the tolerance of McClellan catalysts to limited amounts of sodium and potassium ion, we agree with the board that appellants' claimed catalyst composition of these four elements and claimed method would have been *prima facie* obvious from McClellan and in the absence of evidence to overcome

this *prima facie* case the rejections of claims 1-15, 18, 33 and 34 must be affirmed.

However, we do not agree that McClellan also renders obvious appellants' catalysts containing cesium or rubidium as the essential alkali metal (appealed claims 19 and 26, and claims depending therefrom). Without express comment, the board apparently tacitly adopted the examiner's reasons for rejection:

[N]o patentable distinction was seen in the claimed use of cesium or rubidium rather than the sodium or potassium components taught by the patent. [Emphasis added.]

The reference to "patentable distinction," begs the inquiry under 35 U.S.C. § 103. *Graham v. John Deere Co.*, 383 U.S. 1, 86 S.Ct. 684, 15 L.Ed.2d 645 (1966).

The only possible basis for rejecting appellants' catalyst composition claims requiring cesium or rubidium, not expressly described in McClellan, is the implicit assumption that the McClellan language "alkali metal" makes all elements of Group IA of the Periodic Table, lithium, sodium, potassium, rubidium, cesium and francium, equivalents for modifying bismuth molybdate catalysts. However, the known relationship of lithium, cesium, rubidium and francium to sodium and potassium, as Group IA elements, is not sufficient, in and of itself, to treat them as interchangeable in catalyst compositions. *In re Doumani*, 281 F.2d 215, 217, 126 USPQ 408, 410 (CCPA 1960).

Moreover, there is no description in McClellan which suggests the equivalency inferred by the PTO. The language "alkali metal" as used in McClellan relates to practical sources of contamination of the bismuth molybdate catalyst, by sodium or potassium salts of the molybdate source or by sodium in the carrier. In view of the lack of description in McClellan, or in any other art or record here, of cesium and/or rubidium reactants or catalytic components, McClellan's caveat concerning the effect of alkali metal contamination of catalysts, and the express limit on the amount of alkali metal tolerated by McClellan heat-treated catalysts, we conclude that the efficacy of

the cesium- and rubidium-containing compositions as catalysts in claims 19-32 could only be derived from scrutiny of appellants' specification. Accordingly, the rejections of claims 19-21, 23, 25-28, and 30 are reversed.

V

Turning to the issue of whether appellants have overcome the *prima facie* case of obviousness of claims 1-15, 18, 33 and 34 based on McClellan, we are faced with the question of what evidence must be considered. Appellants ask this court to consider all evidence in Friedrich I, II, III, and IV, as well as all other affidavit and declaration evidence of record. Appellants assert that the board erred in refusing to consider Friedrich III with respect to rejections based on McClellan alone. Friedrich III and Friedrich IV present rebuttal evidence relating to McClellan, as well as information and experiments responding to the board's criticisms of Friedrich II experiments relating to the Japanese patent.

Friedrich III and Friedrich IV, filed during the remand period after the first board decision, in which the rejections based on McClellan alone were affirmed, but before the second appeal, were ultimately entered as evidence by the Commissioner on equitable grounds, although the Commissioner acknowledged the examiner's reasons for refusing to enter the declarations; evidence therein related only to rejections already affirmed by the board in the first decisions.¹⁴ The examiner refused to consider the rebuttal evidence in Friedrich III and IV as it pertained to the rejections which

were the subject of the first appeal, even after entry of the two declarations by the Commissioner, for the following reason:

Rule 198, however, does not authorize the Primary Examiner to consider matters already adjudicated, which Friedrich 111 [sic] declaration clearly attempts to force.

The board apparently adopted the examiner's reason without comment and expressly limited its second decision to consideration of the new rejections.

Rule 198 proscriptions, relating to proceedings after the board's decision, are not relevant to a case remanded, as here, to the examiner by the board under Rule 196(d). Under Rule 196(d), a board decision including a remand is "not ... considered as a final decision in the case." Accordingly, under the express provisions of the rule, the board, after the remand proceedings, "shall ... either adopt its decision as final or render a new decision on all of the claims on appeal." (Emphasis added.) Express PTO policy interpreting Rule 196(d) suggests that the decision containing the remand is not appealable under 35 U.S.C. § 141. Manual of Patent Examining Procedure, § 1213.04 (Oct. 8, 1981). Thus, it was error to apply Rule 198 in this instance.

All evidence presented by appellants should have been considered in connection with all rejections, and in view of the inordinate delays in these proceedings, we will proceed to do so.

Of most significance is the evidence in Friedrich III. By Friedrich III appellants sought to establish that appellants' four-

into the record, but with concomitant delays in ultimate resolution of the issues. It does not appear that such delay would serve any useful purpose. Furthermore, reference is again made to the already lengthy prosecution history of the instant case and the deferral of enforcement of the original patent as noted in Paper No. 89. Therefore, in view of the equities involved and in order to expedite the resolution of the issues in this case ... The Primary Examiner is hereby directed to proceed with dispatch as indicated in Paper No. 89 with the examination of the instant case including considering the Friedrich III and IV affidavits for their probative value and merit. [Emphasis added.]

14. In granting appellants' petition from the examiner's refusal to enter Friedrich III and IV declarations, the Commissioner stated:

[1] It would be inequitable to deny applicants, who are the real parties of interest, as much right to participation and evidentiary showings [in Friedrich III and Friedrich IV] in their own reissue application as has already been accorded on the record to Protestor [by *de facto* entry and consideration of Rohm's declaration by Neme, criticizing Friedrich III].

[2] It is noted that applicants, by virtue of filing a continuation reissue application, could formally introduce said declarations

component catalyst unexpectedly outperforms the composition of McClellan's Example 1 (modified to contain iron as a promoter). The experiment was made on the basis of appellants' catalyst containing sodium as the essential alkali metal component and activated at a temperature between 500° and 1250° F, in ammoxidation after 20 hours on stream to make acrylonitrile.

Initially, it is noted that appellants' process claims 1-5 are directed to isoprene production. Thus, the above comparison "in ammoxidation" is of no help with respect to overcoming the rejections of claims 1-5 and appellants do not so assert.

[3] It is well settled "that objective evidence or non-obviousness must be commensurate in scope with the claims which the evidence is offered to support." *In re Tiffin*, 448 F.2d 791, 171 USPQ 294 (CCPA 1971). With respect to appellants' broad claims to a catalyst with "an alkali metal," the experiments detailed in Friedrich III, being limited to sodium only, are not commensurate in scope, and are, therefore, insufficient to rebut the *prima facie* case. No claim is directed to sodium as the essential alkali metal component.¹⁵ Accordingly, the rejections based on McClellan alone have not been overcome notwithstanding the evidence in Friedrich III.

However, the evidence in Table II of Friedrich II, rebuts any case of *prima facie* obviousness of claim 15. Claim 15 defines appellants' catalyst to be a composition of

potassium, iron, bismuth, molybdenum, and cobalt. In Table II of Friedrich II, appellants have shown that a catalyst of claim 15 results in a percentage improvement (in yield) of 94% over their own catalyst of claims 6 and 7, containing potassium, iron, bismuth, and molybdenum (exclusive of cobalt) in acrolein production at 400°C, while at 310°C, the percentage improvement is even greater, 479%. In evaluating this evidence, we have noted that actual acrolein yields increase with increasing temperature.

None of the prior art reviewed here, including McClellan, describes a catalyst more similar to that of claim 15 than those described in appellants' claims 6 or 7. Accordingly, that comparison in Table II of Friedrich II which shows that the claim 15 catalyst outperformed the others (i.e., claims 6 and 7) is evidence of unexpected superiority. This comparison, and the conclusion based thereon, is the ultimate extension of the "indirect showing of unexpected superiority" sanctioned by precedent. *In re Fenn*, 208 USPQ 470, 473 (CCPA 1981); *In re Fouché*, 439 F.2d 1237, 1241-42, 169 USPQ 429, 433 (CCPA 1971). Accordingly, the rejection of claim 15 based on McClellan is reversed.

VI

The remainder of the rejections are those instituted by the board, pursuant to Rules 196(b) and 196(d). The grounds of rejections in the claim rejections are based on combinations of references. The grounds

temperature" (emphasis added). Accordingly, McClellan suggests three calcination stages. The lack of criticality in McClellan's own description of the temperature of the calcination of catalyst impregnated with promoter can hardly be construed to require a temperature of 750-850°C. Secondly, appellants are criticized for comparison of the two catalysts in ammoxidation; since McClellan expressly discloses use of McClellan catalysts in ammoxidation, an ammoxidation process is a reasonable reaction choice for comparative catalytic activity studies as to catalyst composition claims. Thirdly, intervenor criticizes the comparisons on the grounds that the compared catalysts selectivities are similar. This criticism would only have validity if the catalyst activity and resultant yields were similar, which is not the case here.

15. We have considered, and dismiss, intervenor's criticisms of the reproduction of the McClellan catalyst in Friedrich III. The ultimate unsupported extension of the Rohm and Haas position is that appellants should modify McClellan descriptions to make a "composite" which is appellants' invention. See discussion in *In re Tiffin*, 443 F.2d 394, 399-400, 170 USPQ 88, 93 (CCPA 1971), modified (as to claims 1-3 and 10-16) 448 F.2d 791, 171 USPQ 294 (CCPA 1971). Firstly, it was argued that the McClellan promoter should have been added prior to McClellan's critical calcination stage undertaken at 750° to 850°C. However, McClellan describes (in the generic teaching and in Example 1) undertaking catalyst calcination in two stages, the last stage at 750-850°C, and then describes calcination of the catalyst impregnated with promoter "at any desired

for the section 103 rejections under Rule 196(b) and 196(d) will be considered below, not necessarily in an order relating to the significance of the art to the rejected claims, but rather with respect to the number of claims affected thereby.

A

Rejections Under 35 U.S.C. § 103 Over Hiroki and Sennewald

The examiner refused to entertain the Rohm and Haas suggestion to reject claims over the combination of Sennewald (U.S. Patent No. 3,226,442) and Hiroki (U.S. Patent No. 3,346,517), stating:

[S]uch a rejection would not be valid because there is insufficient basis for combining the Sennewald and Hiroki patents in the manner suggested.

However, in the board's first decision, the board added rejections of claims 6-8, 11, 16, 19, 23-26, 29, 30, and 32, over that combination and recommended similar rejections of allowed claims 17, 22, and 31. The board reasoned:

We must disagree with the Examiner's view that these references are not properly combinable, because both are directed to catalytic compositions utilized in the production of methacrylonitrile from isobutylene.

The utility of the two different catalysts of the Sennewald and Hiroki references might suggest, as the board purported, interchangeability of the catalysts. However, the express descriptions of those references which indicate that components of the two catalysts are not interchangeable is material to the validity of the rejection of catalyst composition claims under 35 U.S.C. § 103.

In the board's limited discussion of this ground of rejection, the board concerned itself mainly with Hiroki without commenting on Sennewald, save for the Sennewald description of utility. Hiroki is directed to modifying a bismuth phospho-molybdate catalyst to improve the yields in ammoxidation processes by increasing the alkalinity of the bismuth phospho-molybdate catalyst. In the express words of Hiroki:

[The bismuth phospho-molybdate catalyst] is made "more alkaline," either by the addition to the bismuth phospho-molybdate catalyst of an alkali metal or alkaline earth metal, or by the substitution of arsenic and/or antimony for a part or all of phosphorous in the phospho-molybdate composition, or further by the addition to the substantial molybdate of an oxide or hydroxide of an alkali or alkaline earth metal.

Hiroki, col. 2, lines 13-20.

Specifically, Hiroki suggests three, apparently equivalent, ways to increase the alkalinity of bismuth phospho-molybdate catalysts. The board treated those three ways of rendering the phospho-molybdate "more alkaline," as equivalent in making the rejection. This is not error as we find no description in Hiroki to indicate otherwise.

Hiroki was applied in the rejection for its suggestion to add alkali metal to a bismuth phospho-molybdate catalyst. Sennewald, silent with respect to alkali metal content, is combined with Hiroki for the Sennewald disclosure of iron addition to bismuth molybdate and to phospho-molybdate catalysts.

Sennewald characterized the improvements over prior catalysts to be based on the following differences "in the content of iron as an additional catalyst component and in the omission of such metals as tungsten, antimony and tin." Omission of antimony, as described by Sennewald, is inconsistent with the express object of Hiroki, to render the bismuth phospho-molybdate catalyst "more alkaline" by the addition of antimony and/or arsenic or its equivalent, the addition of alkali metal or alkaline earth metal.

The board's error, in rejecting claims over Hiroki and Sennewald, lies in its failure to recognize the express prohibition against inclusion of antimony in Sennewald's catalysts. In contrast, we have Hiroki's express statement as to interchangeability of alkali metal and antimony with the same beneficial result. Logical inquiry into the express statements of these two references would suggest lack of interchangeability of the

respective catalytic components. Appellants' successful combination of alkali metal, iron, bismuth and molybdenum for a catalyst composition is contrary to these art descriptions.

Accordingly, we agree with the examiner's original conclusion and reverse the rejections under 35 U.S.C. § 103 of claims 6-8, 11, 16-17, 19, 22-26, and 29-32 over Sennewald in combination with Hiroki.

B

Rejections of Claims over Watanabe, Together with Other Evidence

In additional grounds of rejection, Watanabe was combined by the board with two other references, Yamaguchi, U.S. Patent No. 3,464,630, and Grasselli '631. Certain statements made by appellants with respect to Grasselli were treated as admissions, but these statements do not add information in addition to that of Grasselli '631 itself.

Turning to the substance of the rejections, the Watanabe catalyst systems discussed in section IV (composed of at least one oxide of tungsten, vanadium, molybdenum, uranium, copper, iron and chromium) differ significantly from those of Yamaguchi and Grasselli '631, each of which may require in combination, *inter alia*, iron, bismuth and molybdenum, and each of which differs from the other as to essential additional components. Specifically, Yamaguchi catalysts are oxides of iron, bismuth, phosphorus, molybdenum and nickel or cobalt or both nickel and cobalt, while Grasselli '631 embraces as one catalyst system an oxide system of iron, bismuth, molybdenum, and either nickel or a combination of iron and nickel optionally containing phosphorus, antimony, and tin.

Notwithstanding the Watanabe "suggestion" to use sodium or potassium as a promoter, which is the board's sole reason for reliance on Watanabe, we find no suggestion in Watanabe to look to the description embodied by Yamaguchi or Grasselli '631, or vice-versa, and we find no evidence suggesting interchangeability of Watanabe's catalyst compositions with those required

by the other two references. Absent such suggestions, the description of Watanabe when viewed in terms of catalysts actually exemplified in the 22 examples, provides no reasonable basis for adding Watanabe's sodium or potassium to the combined oxides of iron, bismuth and molybdenum of Yamaguchi and Grasselli '631. In our view, the description of Watanabe, as a whole, would not provide the required reasonable expectation of successful addition of sodium or potassium to catalysts described in the two primary references. *In re Clinton*, 188 USPQ 365, 367 (CCPA 1976); *In re Mercier*, 515 F.2d 1161, 185 USPQ 774 (CCPA 1975).

C

The Rejections Under Rule 196(b) and (d) of Claims 16, 17, 22, 24, 29 and 31

As noted in section II above, there are five different grounds of rejection of various groupings of these six claims. However, we find it necessary to discuss only McClellan taken with Grasselli '631, because of the descriptions of the catalysts of the references previously given.

To recapitulate, McClellan describes heat treatment (at 750° to 850°C) of bismuth molybdate, or bismuth phospho-molybdate, catalysts to render the crystalline structure amorphous, for use in oxydehydrogenations. McClellan, it was determined, suggests addition of iron to the basic catalyst. Moreover, it was determined that McClellan describes that those same catalysts will tolerate sodium or potassium ion impurities or contaminants to certain specified extents.

Grasselli '631 is directed to bismuth molybdate catalysts containing, in addition, the oxides of at least two transition metals, one of them being preferably iron, for use in oxydehydrogenations. Grasselli '631 is relied upon by the PTO for its description indicating that a portion of the bismuth in the base composition may be replaced by antimony, tin, copper, or arsenic. Grasselli '631 is silent with respect to the presence of alkali metal and describes a calcination temperature of above 500°F (about 262°C),

which, according to Grasselli '631 Example 1, may be up to 800°F.

Appealed claim 16 requires the inclusion of antimony in appellants' catalyst containing potassium as the alkali metal. Moreover, appealed claim 16 embraces the inclusion of the second transition metal required by Grasselli '631. On the basis of the record before us, it is our view that a person of ordinary skill would have expected that inclusion of antimony, suggested by Grasselli '631, in the catalyst suggested by McClellan, would produce a composition operative as a catalyst, for example, in oxydehydrogenations.

Appealed claim 17 specifies potassium as the essential alkali metal and activation at 500°F (in air). Appellants argue that the temperature used by McClellan would destroy appellants' "activated catalytic oxide compound." In light of the description in both McClellan and Grasselli '631, more is necessary than appellants' argument with respect to the significance of appellants' temperature recitation. McClellan requires, as appellants point out, conversion of the crystalline composition to an amorphous form at 750-850°C. However, McClellan also indicates that heat treatment at a lower temperature can produce conventional catalysts, but in crystalline rather than the amorphous form which McClellan requires. The Grasselli '631 description concerning catalyst calcination temperatures is cumulative to McClellan's description concerning the effect of calcination temperature on the crystalline form of the composition. If appellants' catalysts, made at the temperature specified in claim 17, exhibit unobvious properties over that described by McClellan, there is no proof of that fact in this record.

Accordingly, we affirm the rejections of claims 16 and 17 over McClellan in view of Grasselli '631.

However, the rejections of claims 22, 24, 29, and 31 over McClellan and Grasselli '631 are reversed for reasons set forth above. These claims require the essential alkali

metal component of appellants' catalyst composition to be cesium or rubidium. As discussed in section IV D, above, McClellan does not describe cesium or rubidium in catalyst compositions; and Grasselli, silent with respect to alkali metals, cannot change that determination.¹⁶

Accordingly, the rejections under 35 U.S.C. § 103 of claims 15 and 19-32 are reversed, and rejections of claims 1-14, 16-18, 33 and 34 under 35 U.S.C. § 103 are affirmed.

AFFIRMED IN PART AND REVERSED IN PART.



Editor's Note: The opinion of the United States Court of Appeals, Federal Circuit in *SSIH Equipment S.A. v. United States International Trade Commission*, published in the advance sheet at this citation, 713 F.2d 746-760 was withdrawn from bound volume and republished at 718 F.2d 365.

Peter Gabor KALMAN, Appellee,

v.

KIMBERLY-CLARK CORPORATION,
Appellant.

Appeal No. 83-540.

United States Court of Appeals,
Federal Circuit.

July 19, 1983.

Patent holder brought action for infringement. The United States District Court for the Eastern District of Wisconsin,

and salts) nor any other art of record describes cesium or rubidium in any catalyst. See n. 11, *supra*.

16. Similarly, neither the Japanese Patent (which describes potassium and sodium salts specifically, and not alkali metal compounds

of the total amount submitted is disallowed.¹⁰ NTEU is thus entitled to recover \$14,233.75 as reasonable attorney fees under the EAJA.¹¹

GRANTED AS MODIFIED.



In re Lucas S. GORDON and Karl M. Sutherland.

Appeal No. 83-1281.

Serial No. 124312.

United States Court of Appeals,
Federal Circuit.

May 10, 1984.

Appeal was taken from a decision of the United States Patent and Trademark Office Board of Appeals affirming an examiner's rejection of appellants' claims one to three and five to seven of application serial No. 124,312 relating to a blood filter assembly. The Court of Appeals, Jack R. Miller, Circuit Judge, held that Board failed to establish a prima facie case of obviousness with regard to the claims in issue.

Reversed.

Patents ¶16.17

Patent and Trademark Office Board of Appeals failed to establish a prima facie

10. According to the affidavits submitted by NTEU, Kerry L. Adams spent 13.5 hours on research and drafting of the response to OPM's petition for rehearing, all of which is disallowed. David S. Handsher spent 20.5 hours on research and drafting of NTEU's motion to dismiss (including consideration of OPM's petition for review), one-half of which is disallowed. Both attorneys billed at \$75 per hour.

11. We reject OPM's unsupported contention that 99.5 hours is per se excessive for NTEU's work relating to its principal and supplemental briefs and preparation for oral argument (OPM suggests that 40 hours is "reasonable"). Similarly,

case of obviousness with regard to claims one to three and five to seven of application serial No. 124,312 relating to a blood filter assembly. 35 U.S.C.A. § 103.

James W. Geriak, Los Angeles, Cal., argued for appellants. With him on brief was Bradford J. Duft, Los Angeles, Cal.

John F. Pitrelli, Arlington, Va., argued for appellee. With him on brief were Joseph F. Nakamura, Sol. and John W. DeWhirst, Associate Sol., Washington, D.C.

Before BENNETT, Circuit Judge, SKELTON, Senior Circuit Judge, and MILLER, Circuit Judge.

JACK R. MILLER, Circuit Judge.

This appeal is from the decision of the United States Patent and Trademark Office ("PTO") Board of Appeals ("board") affirming the examiner's rejection of appellants' claims¹ 1-3 and 5-7 as unpatentable under 35 U.S.C. § 103. We reverse.

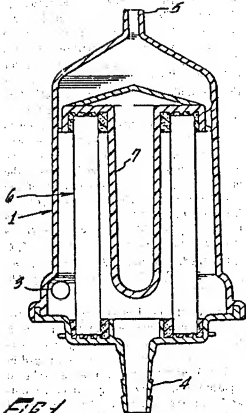
THE INVENTION

Appellants claim a "blood filter assembly" used during surgery and other medical procedures involving the handling of blood to remove clots, bone debris, tissue, or other foreign materials from blood before it is returned to a patient's body. Unlike blood filter assemblies widely used in the prior art, the device of the present invention permits both entry of the blood into, and ultimate discharge of the blood out of, the *bottom* end of the filter assembly, as shown below.²

we reject OPM's contention that some of this work was "duplicative" because two attorneys researched and drafted NTEU's principal brief. We find NTEU's application for fees to be sufficiently detailed, and find that the amount claimed is reasonable under the circumstances of this appeal.

1. In application Serial No. 124,312, filed February 25, 1980, for a "Blood Filter."

2. Extraneous numbers have been removed from this and the subsequent drawing for clarification.



The blood filter assembly comprises a shell 1 provided with blood inlet 3 and blood outlet 4. Between the blood inlet and the blood outlet is filter medium 6 positioned within the filter medium core 7.

The location of blood inlet 3 is such that the incoming blood is directed along a spirally upward path by the inner wall of the shell. Further, the location of the blood inlet at the bottom end of the filter assembly facilitates the removal of gas bubbles by allowing them to rise upwardly out of the blood. The gas bubbles so removed are released from the blood filter assembly by means of a gas vent 5 located in the region of the top end of the assembly.

Independent claim 1, from which the other appealed claims depend, is illustrative:

Blood filter assembly comprising:

- a. a shell having a first top end and a second bottom end,
- b. a blood inlet located in the region of said bottom end and opening into said bottom end,

- c. a blood outlet located in the region of said bottom end,
- d. a gas vent located in the region of said top end, and

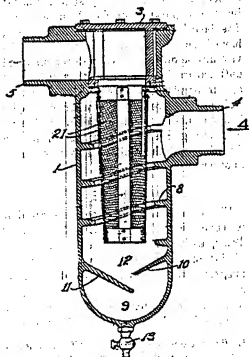
- e. a blood filter medium located between said blood inlet and said blood outlet,

said blood inlet being located and configured in a manner capable of directing incoming blood in a generally spiral path within said shell.

Claims 2, 3, and 5-7 further define the shape of the shell, the shape of the filter medium, and the nature of the material used as the filter medium.

PRIOR ART

The sole reference relied upon by the board is United States Patent No. 1,175,948, issued March 21, 1916, to French. French discloses a liquid strainer for removing dirt and water from gasoline and other light oils. As shown below, the inlet 4 and outlet 5 of the French device are both at the top end of the device.



A continuous helical tooth or thread 8 is formed integral with the inner wall of shell 1 and imparts to the incoming liquid a whirling motion, which gives the liquid a scouring action to help clean the surface of a metal screen filter 21 and guides unwanted dirt and water downwardly into a pocket 9 in the bottom of the shell. A pair of shelves 10 and 11, projecting inwardly and downwardly from the inner wall of the shell, further assists the entrance of dirt and water into the pocket 9 and prevents their being drawn back into the main chamber 12. The reference expressly states, "gravity assists in the separation of heavier oils or water." A pet-cock 13, projecting vertically downward from the bottom of the pocket is used to remove the collected dirt and water periodically. The top of the liquid strainer is completely closed by gland 8 except for the inlet and outlet openings.

BOARD OPINION

The board held that the appealed claims were drawn to an apparatus which "would have at least been rendered *prima facie* obvious to one of ordinary skill in the art by the apparatus disclosed in French." The board's reasoning was that it would have been obvious to turn the French device upside down to have both the inlet and outlet at the bottom, rather than at the top; and to employ French's "pet-cock" as the claimed "gas vent." In the board's opinion, no patentable distinction was created by viewing French's apparatus from one direction and the claimed apparatus from another.

ANALYSIS

We are persuaded that the board erred in its conclusion of *prima facie* obviousness. The question is not whether a patentable distinction is created by viewing a prior art apparatus from one direction and a claimed apparatus from another, but, rather, whether it would have been obvious from a fair reading of the prior art reference as a

3. Because our holding that the PTO has failed to establish a *prima facie* case is dispositive, it is

whole to turn the prior art apparatus upside down. French teaches a liquid strainer which relies, at least in part, upon the assistance of gravity to separate undesired dirt and water from gasoline and other light oils. Therefore, it is not seen that French would have provided any motivation to one of ordinary skill in the art to employ the French apparatus in an upside down orientation. The mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification. See *Carl Schenck, A.G. v. Nortron Corp.*, 713 F.2d 782, 787, 218 USPQ 698, 702 (Fed.Cir.1983), and *In re Sernaker*, 702 F.2d 989, 995-96, 217 USPQ 1, 6-7 (Fed.Cir.1983), both citing *In re Imperato*, 486 F.2d 585, 587, 179 USPQ 730, 732 (CCPA 1973).

Indeed, if the French apparatus were turned upside down, it would be rendered inoperable for its intended purpose. The gasoline to be filtered would be trapped in pocket 9, and the water French seeks to separate would flow freely out of the outlet 5. Further, unwanted dirt would build up in the space between the wall of shell 1 and screen 21, so that, in time, screen 21 would become clogged unless a drain valve, such as pet-cock 13, were re-introduced at the new "bottom" of the apparatus. See *In re Schulpfen*, 390 F.2d 1009, 1013, 157 USPQ 52, 55 (CCPA 1968). In effect, French teaches away from the board's proposed modification.

Because the PTO has failed to establish a *prima facie* case of obviousness, the rejection of claims 1-3 and 5-7 as unpatentable under 35 U.S.C. § 103 must be reversed.*

REVERSED.



unnecessary to reach other arguments raised by appellants.

For the foregoing reasons, the Court of International Trade's modification of Commerce's model-match methodology was improper. Under *Chevron*, the court was bound to defer to Commerce's permissible construction of the statute. *Chevron*, 467 U.S. at 843, 104 S.Ct. at 2782.

CONCLUSION

For the foregoing reasons, we reverse that portion of the September 21, 1993 judgment of the Court of International Trade requiring Commerce to impose a ten percent cap to each of the five criteria used to match U.S. TRBs with home-market TRBs. We affirm the remainder of the judgment. The case is remanded for further proceedings consistent with this opinion.

COSTS

Each party shall bear its own costs.

AFFIRMED IN PART, REVERSED IN PART, and REMANDED.



PALL CORPORATION, Plaintiff/Cross-Appellant,

v.

**MICRON SEPARATIONS, INC.,
Defendant-Appellant.**

Nos. 91-1393, 91-1394 and 91-1409.

United States Court of Appeals,
Federal Circuit.

Sept. 26, 1995.

Rehearing Denied Oct. 24, 1995.

Owner of patent for polyamide membranes used in microfiltration brought infringement action against competitor. The United States District Court for the District of Massachusetts, William G. Young, J., 792 F.Supp. 1298, found infringement. Competitor appealed, and owner cross-appealed from

damages award. The Court of Appeals, Pauline Newman, Circuit Judge, held that: (1) competitor's membrane was "skinless" within meaning of patent; (2) patentee was not estopped by prosecution history from asserting that competitor's membrane infringed under doctrine of equivalents; (3) competitor's membrane infringed, under doctrine of equivalents, patented membrane; (4) competitor did not willfully infringe patent; (5) damages in form of lost profits before settlement of third-party litigation and reasonable royalty rate after that settlement were appropriate; and (6) rate of lost profits was proper.

Affirmed in part, reversed in part, modified in part, and remanded; stay vacated.

Mayer, Circuit Judge, concurred in the judgment and filed opinion.

1. Patents \approx 314(5), 324.5

Patent claim interpretation is question of law, and Court of Appeals reviews construction of claims without deference to that of district court.

2. Patents \approx 165(1), 167(1), 168(2.1)

In construing patent claims, Court of Appeals looks to language of claims, specification, and prosecution history; extrinsic evidence may also be considered, if needed to assist in determining meaning or scope of technical terms in claims.

3. Patents \approx 235(2)

Competitor's membrane literally infringed patented polyamide membranes, used in microfiltration, as use of term "skinless" in patent claim related to performance characteristic, and, although photomicrograph allegedly showed "skin" on competitor's membranes, competitor's membranes did not have barrier layer that blocked fluid flow and thus were "skinless" within meaning of patent.

See publication Words and Phrases for other judicial constructions and definitions.

4. Patents \approx 226.6

Literal patent infringement is found when every limitation of claim is met in accused structure.

5. Patents \Rightarrow 235(2)

Competitor's microfiltration membrane with methylene to amide ratio of 4:1 did not literally infringe patented membrane which claimed ratio of "about 5:1 to about 7:1."

6. Patents \Rightarrow 165(1)

Extrinsic evidence of meaning and usage in the art may be helpful in determining criticality of given parameter in patent claim and may be received from inventor and others skilled in field of invention.

7. Patents \Rightarrow 237

When literal patent infringement is not established, infringement may be proved under doctrine of equivalents when there is not substantial difference between claimed invention and accused product.

8. Patents \Rightarrow 237

On claim of patent infringement under doctrine of equivalents, determination of whether accused product is substantially same as claimed invention is question of fact, and district court's determination thereof is reviewed for clear error.

9. Patents \Rightarrow 168(2.1)

Prosecution history estoppel limits patent infringement by otherwise equivalent structures, by barring patentee's recapture of scope that was surrendered in order to obtain allowance of claims; thus, by actions taken during patent prosecution, patentee can be estopped from reaching subject matter that otherwise meets criteria of equivalency.

10. Patents \Rightarrow 168(2.6)

Patentee's statement to patent examiner that claimed range was "actually rather narrow," after examiner rejected claim, in refiled application for microfiltration membrane which added limitation that membrane have methylene to amide ratio of "about 5:1 to about 7:1," did not estop patentee from arguing that competitor's membrane with ratio of 4:1 infringed under doctrine of equivalents, as change itself was based on patentee's own research, not in response to rejection by examiner.

11. Patents \Rightarrow 168(2.6)

Prosecution history estoppel normally arises when change of claim scope is made in order to overcome patent examiner's rejection based on prior art; estoppel may arise whether change is made by amendment of claims during prosecution or by refiling patent application with changed claims.

12. Patents \Rightarrow 168(2.1), 237

Patentee is estopped from recovering through equivalency that which was deemed unpatentable in view of prior art, but when rejection based on prior art does not dictate claim change that was made, it is necessary to look at specific change and reason, in ascertaining whether estoppel has arisen by virtue of change.

13. Patents \Rightarrow 168(2.3)

Nonsubstantive change in patent claim or change that did not in fact determine patentability does not create prosecution history estoppel.

14. Patents \Rightarrow 167(1)

Rejection of patent claim for lack of support in specification is deemed rejection under statute governing contents of specification; whether amendment or argument made in response to such rejection produces estoppel, as does amendment made to obtain allowance in view of cited references, is dependent on particular facts, and there is no all-encompassing rule that estoppel results from all claim changes, or all arguments, whatever their cause or purpose. 35 U.S.C.A. § 112.

15. Patents \Rightarrow 168(2.6)

Concession made or position taken to establish patentability in view of prior art on which examiner has relied is substantive position on technology for which patent is sought, and will generally generate prosecution history estoppel, but when claim changes or arguments are made in order to more particularly point out applicant's invention, purpose is to impart precision, not to overcome prior art; such prosecution is not presumed to raise estoppel, but is reviewed on its facts, with guidance of precedent.

16. Patents \Rightarrow 237

Doctrine of equivalents serves to guard against fraud on patent, by enabling fair protection of patentee's contribution; it is not controlling whether inventor foresaw and described this potential equivalent at time patent application was filed.

17. Patents \Rightarrow 237

Microfiltration membrane with methylene to amide ratio of 4:1 infringed, under doctrine of equivalents, patented membrane which claimed ratio of "about 5:1 to about 7:1."

18. Patents \Rightarrow 226.6

Patent is infringed if any claim is infringed, for each claim is separate statement of patented invention.

19. Patents \Rightarrow 227

In context of patent infringement, distinction is drawn between infringement that is not deemed "willful" because accused infringer had reasonable basis for believing that its actions did not infringe patent, and infringement that deliberately disregarded property rights of patentee. 35 U.S.C.A. \S 112.

20. Patents \Rightarrow 314(5)

Willfulness of patent infringement is question of fact, for it includes elements of intent, reasonableness, and belief.

21. Patents \Rightarrow 312(8)

Willful patent infringement must be established by clear and convincing evidence, for it is punitive finding and can have consequence of multiplication of damages.

22. Patents \Rightarrow 227

Competitor did not willfully infringe patent for polyamide membranes used in microfiltration by continuing to produce infringing membrane in smaller quantities after shifting most of its production to membrane which did not literally infringe, as partial conversion was not probative of willfulness for continuing production of original membrane; attempt to avoid or mitigate infringement, whether or not successful, did not itself enlarge culpability of continuing activity.

23. Patents \Rightarrow 312(2)

District court's finding that competitor's continued production of membrane which infringed patented membrane, after shifting most of its production to membrane which did not literally infringe patent, did not violate rule precluding introduction of evidence of subsequent remedial measures, as competitor's conversion to different membrane was not relied on as evidence of culpability for prior infringement of original membrane. Fed.Rules Evid.Rule 407, 28 U.S.C.A.

24. Patents \Rightarrow 280

Patent infringement is continuing tort, and infringing action, even if innocently begun, does not automatically retain its purity as circumstances change; filing of lawsuit does not stop clock insofar as culpability may arise from continuing disregard of legal rights of patentee.

25. Patents \Rightarrow 318(4.1)

To recover lost profits damages, patentee must show reasonable probability that, but for infringement, patentee would have made sales that were made by infringer.

26. Patents \Rightarrow 318(4.1)

To establish lost profits for patent infringement where only two suppliers in market are patentee and infringer, patentee must show that there was demand for patented product, absence of acceptable noninfringing substitutes, that patentee was capable of meeting demand, and amount of profits lost.

27. Patents \Rightarrow 318(4.1)

Proper measure of damages in infringement action by patentee for microfiltration membrane was amount of lost profits for all of competitor's infringing sales during time that patents were subject of ongoing litigation between patentee and third party, as third party's products were not noninfringing substitutes at that time, and, after third party litigation ended in license agreement between patentee and third party, reasonable royalty on competitor's infringing sales.

28. Patents \Rightarrow 318(4.1)

Voluntary settlement of patent infringement litigation does not retrospectively

transform accused infringing product into noninfringing substitute, for purpose of determining whether patentee is entitled to lost profits from another infringer.

29. Patents ⇐318(4.1)

District court's setting of 45% as rate of patentee's lost profits, in infringement action, was not improper, despite claim that rate was lower than actual rate proved by patentee, in view of factors including infringer's lower price and evidence that some of infringer's customers would have shifted to membranes other than type produced by patentee and infringer.

30. Patents ⇐318(4.1)

Infringer's sales at lower price generally do not defeat patentee's recovery of its losses at patentee's price, for principle of patent damages is to return patentee to pecuniary position it would have been in but for infringement.

31. Federal Courts ⇐710

District court's written opinion, issued after court's opinion from the bench, would not be stricken, based on defendant's objection to transmittal of "substitute opinion, of any kind," to Court of Appeals, where defendant did not object to opinion after it was forwarded and did not move to strike opinion until two years after it was issued.

H. Michael Hartmann, Leydig, Voit & Mayer, Chicago, IL, argued, for plaintiff/cross-appellant. With him on the brief were Mark E. Phelps, Paul J. Korniczky, Bruce M. Gagala and Jeffrey S. Ward. Also on the brief was George P. Field, Boston, MA.

Steven M. Bauer, Testa, Hurwitz & Thibault, Boston, MA, argued, for defendant-appellant. With him on the brief were Mark Schonfeld and Loretta L. Darden. Also on the brief was Robert M. Ward, Allegretti & Witcoff, Boston, MA.

Roy E. Hofer, President, Federal Circuit Bar Association, Washington, DC, Anne E. Brookes, Honegman, Miller, Schwartz & Cohen, Houston, TX and Robert J. Carlson, Christensen, O'Connor, Johnson & Kindness, Seattle, WA, were on the brief, for amicus curiae, Federal Circuit Bar Association.

R. Carl Moy, Assistant Professor, William Mitchell College of Law, Saint Paul, MN, was on the brief, for amicus curiae, R. Carl Moy.

Donald Chisum, Morrison & Foerster, Seattle, WA, William Alsop, Morrison & Foerster, San Francisco, CA, Gregory A. Long and Kent R. Raygor, Sheppard, Mullin, Richter & Hampton, Los Angeles, CA, Charles Fried and Arthur Miller, Cambridge, MA, were on the brief, for amicus curiae, Auction Corporation and Honeywell, Inc.

S. Leslie Misrock, Rory J. Radding and Steven I. Wallach, Pennie & Edmonds, New York City, were on the brief, for amicus curiae, Ad Hoc Committee to Promote Uniformity in the Patent System.

Roger W. Parkhurst, Parkhurst, Wendel & Rossi, Alexandria, VA, Harold C. Wegner, Wegner, Cantor, Mueller & Player, Washington, DC, Nancy J. Linek, Cushman, Darby & Cushman, Washington, DC, and Gary L. Newton, President, American Intellectual Property Law Association, Arlington, VA, were on the brief, for amicus curiae, American Intellectual Property Law Association.

Before RICH, PAULINE NEWMAN, and MAYER, Circuit Judges.

PAULINE NEWMAN, Circuit Judge.

Both parties appeal aspects of the judgment of the United States District Court for the District of Massachusetts,¹ wherein Micron Separations, Inc. ("MSI") was adjudged

those questions in the case of *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 34 USPQ2d 1321 (Fed.Cir.1995) (*en banc*), the case has been returned to the panel for disposition in accordance therewith.

1. *Pall Corp. v. Micron Separations, Inc.*, No. 86-1427-Y (D.Mass. June 24, 1991). On Nov. 5, 1993 the court decided to hear this case *en banc* in order to consider the questions set forth in the court's order of Jan. 7, 1994. Having resolved

to have infringed a patent owned by Pall Corporation ("Pall") relating to polyamide membranes that are used in microfiltration. We affirm the judgment of infringement, reverse as to willful infringement, modify the damages award, and remand for recalculation of damages.

Background

Microfiltration membranes have an extremely small pore size, and are used to remove unwanted microscopic substances such as bacteria from fluids, or to separate and retain desired microscopic substances such as antibodies. Microfiltration membranes are used, for example, by pharmaceutical companies in bacteria-free drug production, by electronics manufacturers to purify water for chip manufacture, by hospitals to filter contaminants from fluids that are administered to patients, in diagnostics to detect the presence of antibodies or antigens, and as transfer membranes for identification of genetic characteristics. A particularly useful pore size for microfiltration membranes is about 0.22 micron, for this pore size yields the highest flow rate consistent with retention of the 0.3 micron *Pseudomonas diminutia* bacteria; removal of these bacteria is the standard criterion for sterilization by microfiltration.

Microfiltration membranes are not new, although membranes of the prior art were generally subject to deficiencies such as brittleness, excessive shrinkage, poor solvent resistance, limited flow rate, excessive clogging, and limited sterilizing ability. Microfiltration membranes had previously been made from organic polymers, but those membranes generally required the use of wetting agents for filtration, for water does not flow well through microporous membranes that are not instantly wettable. The addition of wetting agents to facilitate flow is undesirable because it adds impurities to the system.

In accordance with United States Patent No. 4,340,479, invention of Dr. David B. Pall

("the Pall patent"), microfiltration membranes are made from organic polymers called polyamides. The particular polyamides of this invention are sometimes called "nylons," the generic term for linear aliphatic polyamides. The polyamide membranes at issue were made from the commercially available polymers nylon 66 and nylon 46.² The method of making these membranes and the membranes themselves are described in the Pall patent and in the district court's opinion, and will be repeated only as necessary to explain our decision.

Membranes had been made of polyamides before Dr. Pall's invention, but the prior membranes were either soluble in alcohol or required the use of wetting agents for efficient filtration. The membranes of the prior art also had a surface skin of reduced porosity that retarded wettability of the membrane material and increased the flow time. The Pall patented membranes are naturally and instantaneously wettable and alcohol-insoluble, with uniform pore size throughout the membrane. They achieve efficient flow without the use of wetting agents. The Pall membranes, due to their improved properties and increased effectiveness in microfiltration, achieved not only commercial success but also scientific recognition. The trial court found:

Dr. Pall and his associates were pioneers both in the invention, development, and commercialization of functional nylon microfiltration membranes and in the theory of microfiltration.

The Pall microfiltration membranes were made of nylon 66, and were introduced into commerce in 1978. The Pall patent issued in 1982. In 1983 MSI introduced a microfiltration membrane made of nylon 66. Pall filed suit in 1986. In 1989 MSI converted most, but not all of its nylon 66 membrane production to nylon 46. The case came to trial in 1991.

The district court held that the Pall patent was valid, that MSI's nylon 66 membranes

from the diamine monomer, and the second 6 represents the number of carbon atoms in the diacid monomer. Nylon 46 has 4 carbon atoms in the diamine and 6 carbon atoms in the diacid.

2. In this common nomenclature for nylon polyamides, integers signify the number of carbon atoms in the monomers from which the polymer is made. For example, in nylon 66 the first 6 represents the number of carbon atoms derived

literally infringed the patent's product claims, that MSI's nylon 46 membranes infringed the product claims under the doctrine of equivalents, and that MSI's process for producing the nylon membranes infringed the patent's process claims under the doctrine of equivalents. The court held that MSI's infringement was willful to the limited extent of MSI's continued manufacture of some nylon 66 membranes after it had shifted most of its production to nylon 46. Although MSI declared bankruptcy after the adverse district court judgment,³ it remains operating under a stay of injunction granted by the district court as to MSI's nylon 46 membranes.⁴

MSI appeals the rulings of infringement and willful infringement. Pall cross-appeals aspects of the damage award.

INFRINGEMENT

Nylon 66 Membranes

A representative product claim of the Pall patent is:

34. A hydrophilic skinless alcohol-insoluble polyamide resin membrane sheet of alcohol-insoluble hydrophobic polyamide resin selected from the group consisting of polyhexamethylene adipamide, polyhexamethylene sebacate, and poly-ε-caprolactam, and capable when completely immersed in water of being wetted through within no more than one second, and reverting when heated to a temperature just below the softening temperature of the membrane to a hydrophobic material which is no longer wetted by water.

Nylon 66 is polyhexamethylene adipamide, named in claim 34. It was not disputed that all of the limitations of claim 34 were met by MSI's nylon 66 membranes, except for the term "skinless," the meaning of which received extensive attention at trial. MSI argued that the plain meaning of "skinless" eliminated the MSI products from infringement, because a photomicrograph showed a "skin" on the MSI membranes. Pall's position was that "skinless" as used in the specification and claims should be understood as a

performance characteristic, for a skin is a nonporous layer that impedes filtration.

[1, 2] Claim interpretation is a question of law. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 34 USPQ2d 1321 (Fed.Cir. 1995) (*en banc*). We review the construction of the claims without deference to that of the district court. *Id.* at 979, 34 USPQ2d at 1329 ("Because claim construction is a matter of law, the construction given the claims is reviewed *de novo* on appeal.") In construing the claims we look to the language of the claims, the specification, and the prosecution history. *Id.* Extrinsic evidence may also be considered, if needed to assist in determining the meaning or scope of technical terms in the claims. *Id.* at 980, 34 USPQ2d at 1330.

[3] At trial both sides presented support for their conflicting positions concerning the term "skinless." Pall presented data showing "bubble point," "flow time," and "KL curve" measurements of the membranes in suit. These measurements were described in the Pall patent specification as tests for determining the presence or absence of a skin on a membrane. The bubble point test measures the pressure applied to a membrane whose pores are filled with water in order to force the water through the pores; the larger the bubble point value, the smaller the pores in the membrane. Flow time is the time required for a certain amount of water to pass through a given area of membrane; the smaller the pores the longer the flow time. The KL curve depicts the flow of water through a membrane at constant pressure; skinless membranes characteristically show an initially level KL curve followed by a sharp rise in the curve as flow commences, whereas KL curves for skinned membranes show a gradual upward-sloping curve. These are generally accepted tests of whether a membrane is skinned or skinless, for a nonporous skin impedes the passage of water through the membrane, and is detected by all three tests. The district court defined "skinless" as a performance characteristic in accordance with the parameters of these tests. We too conclude, based on the specification

3. *In re Micron Separations, Inc.*, No. 91-41885-JFO (Bankr.D.Mass.).

4. *Pall Corp. v. Micron Separations, Inc.*, No. 86-1427-Y, slip op. at 1.

and the data in evidence, that "skinless" is properly construed as a performance characteristic, and that a surface that does not impede flow is "skinless" as that term is used in the art of filtration membranes.

The district court then applied the construed claims to MSI's membranes. The court found that the MSI membranes had bubble points, flow times, and KL curves characteristic of skinless membranes. The court also observed that MSI's product literature described its membranes as of uniform pore size or having precise porosity, which the court found were necessary characteristics of skinless membranes. The court thus found, on the totality of the evidence, that the MSI membranes did not have a barrier layer that blocked fluid flow, and that the MSI membranes were skinless as the Pall patent used that term. We discern no clear error in this finding.

[4] Literal infringement is found when every limitation of a claim is met in the accused structure. Applying its interpretation of the term "skinless," which we have confirmed, the district court found that the MSI nylon 66 membranes literally infringed the Pall patent. The judgment of infringement by MSI's nylon 66 membranes is affirmed.

Nylon 46 Membranes

Three years after Pall filed this suit, MSI converted most of its membrane manufacture from nylon 66 to nylon 46. Nylon 46 is made not from hexamethylenediamine and adipic acid, but from tetramethylenediamine and adipic acid. Claim 34, quoted *supra*, does not name polytetramethylene adipamide (nylon 46). However, claim 116 of the Pall patent describes the polyamide resins in terms of their methylene to amide ratio:

116. A hydrophilic skinless alcohol-insoluble polyamide resin membrane sheet of alcohol-insoluble hydrophobic polyamide resin having a ratio CH_2/NHCO of *methylenes* CH_2 to *amide* NHCO groups within the range of about 5:1 to about 7:1; capable when completely immersed in water of being wetted through within no more than one second, and reverting when heated to a temperature just below the softening

temperature of the membrane to a hydrophobic material which is no longer wetted by water. [Emphasis added.]

Nylon 66 has a ratio of methylene to amide groups of 5:1. Nylon 46 has a ratio of 4:1. Pall asserts that the term "about 5:1 to about 7:1" is infringed by the ratio of 4:1, either literally or by the doctrine of equivalents.

A. Literal Infringement

[5] The district court, construing the term "about 5:1 to about 7:1," observed that the word "about" does not have a universal meaning in patent claims, and that the meaning depends on the technological facts of the particular case. We have so held. *E.g., Andrew Corp. v. Gabriel Electronics, Inc.*, 847 F.2d 819, 821-22, 6 USPQ2d 2010, 2013 (Fed.Cir.), *cert. denied*, 488 U.S. 927, 109 S.Ct. 312, 102 L.Ed.2d 830 (1988); *W.L. Gore & Assoc. Inc. v. Garlock, Inc.*, 842 F.2d 1275, 1280, 6 USPQ2d 1277, 1282 (Fed.Cir.1988).

[6] The determination of whether the literal meaning or scope of "about 5:1 to about 7:1" includes 4:1 is a matter of claim construction, a question of law for decision *de novo* by this court. The use of the word "about," avoids a strict numerical boundary to the specified parameter. Its range must be interpreted in its technologic and stylistic context. We thus consider how the term "about 5:1 to about 7:1" was used in the patent specification, the prosecution history, and other claims. It is appropriate to consider the effects of varying that parameter, for the inventor's intended meaning is relevant. Extrinsic evidence of meaning and usage in the art may be helpful in determining the criticality of the parameter, and may be received from the inventor and others skilled in the field of the invention. See *Markman*, 52 F.3d at 980, 34 USPQ2d at 1330 ("The court may, in its discretion, receive extrinsic evidence in order 'to aid the court in coming to a correct conclusion' as to the 'true meaning of the language employed' in the patent.") (quoting *Seymour v. Osborne*, 78 U.S. (11 Wall.) 516, 546, 20 L.Ed. 38 (1871)).

Dr. Pall, the inventor, explained his usage of "about 5:1 to about 7:1" as deriving from

his tests of the performance of various nylon resin membranes. He explained that the ratios change in half integers, e.g., 7:1, 6.5:1, 6:1, etc., depending on the total number of methylene groups in the acid and amine components of the polymer. For example, each recurring unit of nylon 66 contains 10 methylene groups and 2 amide groups, for a ratio of 10:2, which reduces to 5:1. Each recurring unit of nylon 46 contains 8 methylene groups and 2 amide groups, for a ratio of 4:1. The Pall patent also illustrated a mixture having the ratio of 5.3:1.

Dr. Pall testified that he conducted experiments with several commercially available nylon resins. He found that a nylon resin having a methylene:amide ratio higher than 7:1 produced membranes that were less readily wettable, such that use of a wetting agent was required for optimum results. He therefore placed the upper limit of "about 7:1" in the claims. Dr. Pall stated that the only commercially available nylon resin with a ratio lower than 5:1 was a nylon with the ratio of 3:1, and that he made a membrane of the 3:1 nylon and found it to be soluble in alcohol and therefore unacceptable. No experiments were conducted with a nylon between 3:1 and 5:1, he testified, because none was commercially available. He placed the lower limit at "about 5:1." The reasons for these claim limitations also appear in the patent specification.

The district court found that Dr. Pall's use of the word "about" was "appropriate." We agree that the evidence showed that an exact limitation would have been inappropriate. However, the evidence showed that while a ratio of 7:1 was satisfactory, higher ratios were not, suggesting that the upper limit was close to 7:1, and did not extend to, for example, 8:1. At the lower ratios, although Dr. Pall conducted no tests with resins between 3:1 and 5:1, the 3:1 resin was clearly unsatisfactory. Reviewing all the evidence, the district court held that a literal reading of "about 5:1 to about 7:1" did not include the ratio of 4:1. On plenary review we reach the same conclusion.

Since the claim is construed more narrowly than would literally encompass the ratio of 4:1, the district court's finding that MSI's

nylon 46 membranes do not literally infringe the Pall patent is affirmed.

B. Infringement by Equivalents

[7, 8] When literal infringement is not established, infringement may be proved under the doctrine of equivalents when there is not a substantial difference between the claimed invention and the accused product. *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 70 S.Ct. 854, 94 L.Ed. 1097, 85 USPQ 328 (1950); *Hilton Davis Chemical Co. v. Warner-Jenkinson Co.*, 62 F.3d 1512, 35 USPQ2d 1641 (Fed.Cir.1995) (*en banc*). The determination of whether the accused product is substantially the same as the claimed invention is a question of fact, and the district court's determination thereof is reviewed for clear error. *Id.* at 1521, 35 USPQ2d at 1647.

The district court found that MSI's nylon 46 membranes had substantially the same chemical and physical structure, performed the same function in the same way, and achieved the same result, as Pall's claimed membranes. The court thus found that claim 116 was infringed under the doctrine of equivalents.

MSI does not argue on this appeal that the nylon 46 and nylon 66 membranes are not equivalent. Instead, MSI argues that Pall is estopped to establish infringement based on equivalency because during patent prosecution Pall voluntarily gave up claim scope that would have literally included nylon 46. MSI asserts that Pall is estopped from obtaining that scope under the doctrine of equivalents, even if the products are in fact equivalent.

[9] Prosecution history estoppel limits infringement by otherwise equivalent structures, by barring recapture by the patentee of scope that was surrendered in order to obtain allowance of the claims. *Mannesmann Demag Corp. v. Engineered Metal Products Co.*, 793 F.2d 1279, 1285, 230 USPQ 45, 48 (Fed.Cir.1986); *Thomas and Betts Corp. v. Litton Sys., Inc.*, 720 F.2d 1572, 1579, 220 USPQ 1, 6 (Fed.Cir.1983). Thus, by actions taken during patent prosecution the patentee can be estopped from reaching

subject matter that otherwise meets the criteria of equivalency.

[10] Pall states that there is no estoppel with respect to nylon 46, because no claim scope covering nylon 46 was yielded due to prior art or based on any requirement of patent examination. We outline the circumstances: Pall's initial patent application contained broad claims, wherein the only limit placed on the nylon polyamide resin was that it be insoluble in alcohol. These claims stated no upper or lower limit to the methylene:amide ratio. Dr. Pall testified that upon continuing his research while his patent application was pending, he discovered that his view of the nylon resins usable in his invention was too broad. He eventually refiled the patent application with additional data, and claims to nylon resins "within the range of about 5:1 to about 7:1." Dr. Pall stated, and the prosecution record is in accord, that the refiled was based not on prior art or any requirement by the patent examiner, but on his own research.

The examiner for the continuation-in-part application at first rejected the new ratio claims under 35 U.S.C. § 112, stating that the claimed range was too broad and unsupported by the disclosure. No prior art was cited. Dr. Pall responded that the claimed range was "actually rather narrow" and that the claims "clearly exclude the vast majority of polyamide resins." MSI relies on this statement as the basis of estoppel. MSI states that whether polyamide resins having a ratio below about 5:1 were required by the examiner to be surrendered, or were voluntarily not claimed by Pall, resins having a 4:1 ratio are excluded by estoppel because of this response to the examiner. Pall states that "about 5:1" was simply descriptive of the inventor's knowledge at the time the continuation-in-part application was filed, and that there is no estoppel against the admittedly equivalent 4:1 resin.

[11-13] Prosecution history estoppel normally arises when a change of claim scope is made in order to overcome an examiner's rejection based on prior art. Estoppel may arise whether the change is made by amendment of the claims during prosecution, or by refiled the patent application with changed

claims. Thus a patentee is estopped from recovering through equivalency that which was deemed unpatentable in view of the prior art. However, when a rejection based on prior art did not dictate the claim change that was made, it is necessary to look at the specific change and the reason, in ascertaining whether an estoppel has arisen by virtue of the change. *Diversitech Corp. v. Century Steps, Inc.*, 850 F.2d 676, 681, 7 USPQ2d 1315, 1320 (Fed.Cir.1988). See *Bayer Aktiengesellschaft v. Duphar Int'l Research B.V.*, 738 F.2d 1237, 1243, 222 USPQ 649, 653 (Fed.Cir.1984) ("a close examination must be made as to not only what was surrendered, but also the reason for such a surrender"); *Hughes Aircraft Co. v. United States*, 717 F.2d 1351, 1363, 219 USPQ 473, 481 (Fed.Cir. 1983) (an amendment to a claim may "have a limiting effect within a spectrum ranging from great to small to zero"). We take note that in the course of patent examination claims are often amended and rewritten and added and subtracted. A non-substantive change or a change that did not in fact determine patentability does not create an estoppel. *Lairum Corp. v. NEC Corp.*, 952 F.2d 1357, 1361, 21 USPQ2d 1276, 1279 (Fed. Cir.1991).

[14] The estoppel asserted by MSI arose not from prior art but from Pall's statement to the examiner, in response to the rejection that the claims were too broad and unsupported by the disclosure, that the claims were "actually rather narrow." There were no changes made in the claims in response to this rejection. A rejection for lack of support in the specification is deemed a rejection under 35 U.S.C. § 112, first paragraph. *In re Borkowski*, 422 F.2d 904, 909, 164 USPQ 642, 646 (CCPA 1970). Section 112, first paragraph, states in part:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, to make and use the same....

Whether amendment or argument made in response to a rejection under § 112 produces

an estoppel, as does an amendment made to obtain allowance in view of cited references, is dependent on the particular facts. There is no all-encompassing rule that estoppel results from all claim changes, or all arguments, whatever their cause or purpose. *Laitram v. NEC*, 952 F.2d at 1361, 21 USPQ2d at 1280; *Hi-Life Products, Inc. v. American National Water-Mattress Corp.*, 842 F.2d 323, 325, 6 USPQ2d 1132, 1134 (Fed.Cir.1988).

[15] As we have observed, a concession made or position taken to establish patentability in view of prior art on which the examiner has relied, is a substantive position on the technology for which a patent is sought, and will generally generate an estoppel. In contrast, when claim changes or arguments are made in order to more particularly point out the applicant's invention, the purpose is to impart precision, not to overcome prior art. Such prosecution is not presumed to raise an estoppel, but is reviewed on its facts, with the guidance of precedent. See, e.g., *Sun Studs, Inc. v. ATA Equipment Leasing, Inc.*, 872 F.2d 978, 990, 10 USPQ2d 1338, 1348 (Fed.Cir.1989) (rejection for lack of enablement, withdrawn based on the patentee's arguments, did not serve as a basis for estoppel "in these events"); *Moeller v. Ionetics, Inc.*, 794 F.2d 653, 659-60, 229 USPQ 992, 996-97 (Fed.Cir.1986) ("on this record" prosecution history estoppel not applicable to amendment to more particularly point out the invention); *Mannesmann Demag*, 793 F.2d at 1285, 230 USPQ at 48 (estoppel not necessarily created by an amendment designed only to remove a § 112 indefiniteness rejection); *Caterpillar Tractor Co. v. Berco, S.p.A.*, 714 F.2d 1110, 1115, 219 USPQ 185, 187-88 (Fed.Cir.1983) (prosecution history estoppel not found where rejection based on indefiniteness under § 112, since prior art did not dictate the limitation at issue).

[16] MSI argues that even if prosecution history estoppel does not limit Pall's claims to precisely the 5:1 to 7:1 range, the doctrine of equivalents can be invoked only for subject matter that is disclosed and enabled in the patent specification but not claimed. That is incorrect. The doctrine serves to guard against "fraud on a patent," *Grover Tank*,

339 U.S. at 608, 70 S.Ct. at 856, 85 USPQ at 330, by enabling fair protection of the patentee's contribution. It is not controlling whether the inventor foresaw and described this potential equivalent at the time the patent application was filed. See, e.g., *Atlas Powder Co. v. E.I. du Pont de Nemours & Co.*, 750 F.2d 1569, 1581, 224 USPQ 409, 417 (Fed.Cir.1984).

[17] The district court applied these principles. The court found that Pall had not surrendered or abandoned patent protection outside of the 5:1 to 7:1 range, and that Pall's voluntary restriction of the claims in the continuation-in-part application, and the response to the examiner's rejection under § 112, did not produce an estoppel with respect to the 4:1 product. The court found that although nylon 46 had been known chemically since 1942, nylon 46 was not commercially available at the time of Dr. Pall's invention. The court stated: "I do not find that nylon 46 was known in the sense that there was any requirement that Pall experiment with nylon 46 to understand its properties." Observing the close similarity in chemical structure and the identity of function, way, and result to the claimed membranes, the district court found infringement by MSI's nylon 46 membranes under the doctrine of equivalents.

We discern no reversible error in the application of the law of estoppel to the facts of this case, or in the court's finding that the nylon 46 membranes infringed under the doctrine of equivalents. The judgment of infringement is affirmed.

The Process Claims

[18] In view of our affirmance of infringement of the product claims for the nylon 66 and nylon 46 membranes, we need not reach the process claims. A patent is infringed if any claim is infringed, *Intersect America, Inc. v. Kee-Vet Lab., Inc.*, 887 F.2d 1050, 1055, 12 USPQ2d 1474, 1477-78 (Fed. Cir.1989), for each claim is a separate statement of the patented invention. 35 U.S.C. § 282; *Jones v. Hardy*, 727 F.2d 1524, 1528, 220 USPQ 1021, 1024 (Fed.Cir.1984).

Willfulness

[19] In the context of patent infringement, a distinction is drawn between infringement that is not deemed "willful" because the accused infringer had a reasonable basis for believing that its actions did not infringe the patent, and infringement that deliberately disregarded the property rights of the patentee. See *Stickle v. Heublein, Inc.*, 716 F.2d 1550, 1565, 219 USPQ 377, 388 (Fed.Cir.1983).

[20, 21] Willfulness of infringement is a question of fact, for it includes elements of intent, reasonableness, and belief. See *Richardson v. Suezki Motor Co.*, 868 F.2d 1226, 1250, 9 USPQ2d 1913, 1932 (Fed.Cir.1989); *King Instrument Corp. v. Otari Corp.*, 767 F.2d 853, 867, 226 USPQ 402, 412 (Fed.Cir. 1985); *Underwater Devices, Inc. v. Morrison-Knudsen Co.*, 717 F.2d 1380, 1390, 219 USPQ 569, 576-77 (Fed.Cir.1983). The boundary between unintentional and culpable acts is not always bright, see *Rite-Hite Corp. v. Kelley Co.*, 819 F.2d 1120, 1125-26, 2 USPQ2d 1915, 1919 (Fed.Cir.1987), for the facts often include subjective as well as objective elements. Thus willful infringement must be established by clear and convincing evidence, *E.I. du Pont de Nemours & Co. v. Phillips Petroleum Co.*, 849 F.2d 1430, 1440, 7 USPQ2d 1129, 1137 (Fed.Cir.), cert. denied, 488 U.S. 986, 109 S.Ct. 542, 102 L.Ed.2d 572 (1988), for it is a punitive finding, and can have the consequence of multiplication of damages.

[22] The district court found that MSI's infringement was not willful at its inception and for several years thereafter. The court found that although MSI failed to obtain an infringement opinion of counsel before producing its nylon 66 membranes, MSI made "significant efforts to avoid the claims of the patent." Thus the district court found that MSI's infringing production of nylon 66 membranes from 1983 until October 1989 was not willful. The court also found that

MSI's production of nylon 46 membranes after October 1989 did not constitute willful infringement. Pall does not appeal these findings.

In October 1989 MSI shifted most of its production to nylon 46 membranes. However, MSI continued to manufacture some membranes using nylon 66. The district court referred to MSI's shift to nylon 46 as evidence that MSI knew that it had an alternative to its nylon 66 product, and found that MSI should have known by that time that its nylon 66 product infringed the Pall patent. The court stated that it assumed that MSI had acquired competent patent counsel, after three years of litigation. On these grounds the district court found that MSI's failure to shift to nylon 46 for all of its production showed the requisite culpability to sustain willfulness, from that time forward, with respect to MSI's continuing nylon 66 membrane production. The court doubled the damages for MSI's infringing sales of nylon 66 after October 1989. MSI appeals these rulings.

[23] MSI argues that the district court violated Federal Rule of Evidence 407 in finding that MSI's continued production of nylon 66 membranes, after MSI switched to nylon 46, was willful infringement. Rule 407 bars evidence of subsequent remedial action in proving culpability for a prior act or event.⁵ The policy implemented by Rule 407 is to avoid inhibiting post-accident repair, lest additional injury occur. *Herndon v. Seven Bar Flying Service, Inc.*, 716 F.2d 1322, 1327 (10th Cir.1983), cert. denied, 466 U.S. 958, 104 S.Ct. 2170, 80 L.Ed.2d 563 (1984). Here MSI's conversion to nylon 46 was not relied on as evidence of culpability for the prior infringement by nylon 66 membranes, and the court declined to find willfulness for that prior infringement. Thus by its terms Rule 407 was not violated.

[24] However, patent infringement is a continuing tort, and an action even if inno-

5. Rule 407. When, after an event, measures are taken which, if taken previously, would have made the event less likely to occur, evidence of the subsequent measures is not admissible to prove negligence or culpable conduct in connection with the event. This rule does not require

the exclusion of evidence of subsequent measures when offered for another purpose, such as proving ownership, control, or feasibility of precautionary measures, if controverted, or impeachment.

cently begun does not automatically retain its purity as circumstances change. The filing of a lawsuit does not stop the clock insofar as culpability may arise from continuing disregard of the legal rights of the patentee. The district court relied on the fact that MSI switched to an alternative product three years into the litigation, yet continued to produce some of the nylon 66 membranes.

Willfulness of infringement after October 1989 is determined on the totality of the evidence. We do not hold that because the infringement was found not to be willful when begun, there is a greater burden on the patentee to prove willfulness as circumstances change. The requirement of law-abiding respect for the property of others is not reduced simply because lesser transgressions were overlooked. However, upon the ruling that willfulness was not established for MSI's activities during the initial six years of infringement, the partial conversion to the nylon 46 product while continuing some of the nylon 66 production is not probative of willfulness for the nylon 66 continuing production. Attempts to avoid or mitigate infringement, whether or not successful, do not of themselves enlarge the culpability of the continuing activity.

The finding of willful infringement for the continuing production of nylon 66 is clearly in error. Absent other grounds for the finding of willfulness, this ruling and the award of damages attributed thereto are reversed.

DAMAGES

A

The district court awarded damages measured by Pall's lost profits on 25% of MSI's infringing sales, and a royalty of 8% on the remaining 75% of MSI's infringing sales. The district court relied on the presence in the marketplace of nylon membranes sold by Cuno Corporation, with whom Pall had settled worldwide litigation with respect to the patent here in suit and several Cuno patents, each having charged the other with infringement. Pall states that it is entitled to lost profits on all of MSI's infringing sales, at least until May 9, 1990, when Pall granted immunity to Cuno under the Pall patent.

[25, 26] In order to recover lost profits damages the patentee "must show a reasonable probability that, 'but for' the infringement, it would have made the sales that were made by the infringer." *Rite-Hite Corp. v. Kelley Co.*, 56 F.3d 1538, 1545, 35 USPQ2d 1065, 1069 (Fed.Cir.1995) (*en banc*); *Varoay Corp. v. Ever-Control USA, Inc.*, 775 F.2d 268, 275, 227 USPQ 352, 357 (Fed.Cir.1985); *King Instrument*, 767 F.2d at 863, 226 USPQ at 409. In a market with only two suppliers, the patentee and the infringer, this requirement is readily met, for example by applying the guideline set forth in *Panduit Corp. v. Stahl Bros. Fibre Works, Inc.*, 575 F.2d 1152, 1156, 197 USPQ 726, 730 (6th Cir.1978). To establish lost profits by applying the evidentiary guideline of *Panduit* the patentee must show (1) that there was a demand for the patented product, (2) the absence of acceptable noninfringing substitutes, (3) that the patentee was capable of meeting the demand, and (4) the amount of profits lost. This guideline facilitates the determination of damages by stating conditions which allow the inference that the patentee would reasonably have made the infringer's sales. See *Del Mar Avionics, Inc. v. Quinton Instrument Co.*, 836 F.2d 1320, 1327, 5 USPQ2d 1255, 1260 (Fed.Cir.1987).

[27] The district court, applying this guideline, held that the Cuno membranes were "acceptable noninfringing substitutes" for the Pall membranes. Pall states that this is incorrect, that the Cuno membranes were the subject of ongoing infringement litigation until May 1990, when they were licensed. The district court should have recognized the distinction between the legal and market situation before and after the licensing of the Cuno products. During the period before the Cuno products were licensed their presence in the marketplace did not defeat Pall's entitlement to lost profits damages for all of MSI's infringing sales, for the Cuno products were not "noninfringing substitutes."

[28] It was not necessary for Pall to continue the Cuno litigation to judicial decision of the issue of infringement, as MSI argues. The voluntary settlement of litigation does not retrospectively transform an accused in-

fringing product into a "noninfringing substitute." See *State Indus., Inc. v. Mor-Flo Indus., Inc.*, 883 F.2d 1573, 1578, 12 USPQ2d 1026, 1029 (Fed.Cir.1989) (if the other suppliers "were likely infringers," State would have been entitled to their shares of the market in determining damages based on lost sales), cert. denied, 493 U.S. 1022, 107 L.Ed.2d 744 (1990); *Micro Motion, Inc. v. Kane Steel Co.*, 894 F.2d 1318, 1322, 13 USPQ2d 1696, 1699 (Fed.Cir.1990) (there is precedent for finding causation for lost profits damages if the alternative source of supply is an infringer); *Datascope Corp. v. SMEC, Inc.*, 879 F.2d 820, 824-25, 11 USPQ2d 1321, 1323-24 (Fed. Cir.1989) (the finding that there was an acceptable noninfringing alternative can not be supported by the ongoing litigation between Datascope and a third party), cert. denied, 493 U.S. 1024, 110 S.Ct. 729, 107 L.Ed.2d 747 (1990).

However, after Pall settled with Cuno, the district court correctly held that Cuno's presence in the marketplace could not be ignored, and limited the award of lost profits to the share of MSI's sales that Pall would reasonably have made. For the remaining share the court viewed Pall as a hypothetical willing licensor, and accordingly assessed damages as an 8% royalty. This holding implements the reasoning that the purpose of compensatory damages is not to punish the infringer, but to make the patentee whole. See *Aro Mfg. Co. v. Convertible Top Replacement Co.*, 377 U.S. 476, 507, 84 S.Ct. 1526, 1543, 12 L.Ed.2d 457, 141 USPQ 681, 694 (1964) (the question to be asked is "Had the infringer not infringed, what would the patent holder ... have made?"); *State Industries*, 883 F.2d at 1577, 12 USPQ2d at 1028 (damages shall compensate the patentee for its pecuniary loss because of the infringement). Pall argues that this result provides a windfall to the infringer, for when there are multiple infringers the infringement will be profitable to the remaining infringers as soon as the patentee settles with any one of them. We doubt that injustice is inevitable, for the setting of the royalty rate and the discretion to multiply damages can assist in achieving a just remedy.

In summary, for MSI's sales after Pall settled with Cuno, we affirm the damages award based on recovery of Pall's lost profits for 25% of MSI's infringing sales, and a royalty of 8% for the remaining 75% of MSI's infringing sales. For the period before the grant of immunity to Cuno, Pall shall recover damages measured as its lost profits for all of MSI's infringing sales. We remand for the recalculation of damages.

B

[29] The district court selected 45% as the rate of Pall's lost profits. MSI does not challenge this rate on appeal. However, Pall appeals this determination, stating that the court selected an arbitrary rate that was lower than the actual rate that Pall had proved.

Among its reasons for reducing the rate from that presented by Pall's accountants, the district court considered that MSI's prices were lower than Pall's, concluded that some of MSI's customers would have shifted to membranes other than nylon, and factored this into its reduction of Pall's estimated profits. Pall disputes the presence as well as the significance of asserted price differentials, and challenges the other premises of the district court's decision.

[30] In general, an infringer's sales at a lower price do not defeat the patentee's recovery of its losses at the patentee's price, for the principle of patent damages is to return the patentee to the pecuniary position it would have been in but for the infringement. *Aro Manufacturing*, 377 U.S. at 507, 84 S.Ct. at 1543, 141 USPQ at 694. See also *Rite-Hite*, 56 F.3d at 1544, 35 USPQ2d at 1068 ("The statute thus mandates that a claimant receive damages 'adequate' to compensate for infringement.") However, in view of the complex of financial factors presented at trial, we discern no clear error in the district court's finding of the rate of Pall's lost profits. The district court's ruling on this aspect is affirmed.

Motions

[31] MSI moves to strike the opinion of the district court that was written on April

14, 1992. That opinion was an edited form of the court's prior opinion from the bench, the district court having reserved the right to present a written opinion. Although MSI objected to Pall's proposed substitute opinion, and to the transmittal to this court of a "substitute opinion, of any kind," it made no objection to that opinion after it was forwarded by the district court and did not move to strike it until two years after the district court's edited opinion was issued. MSI offers no explanation for the delay. The motion is denied.

Pall in turn states that the court should strike MSI's argument on the merits, raised in MSI's motion to strike the opinion of the district court. In view of our disposition herein, the motion is dismissed as moot.

Injunction

The stay of injunction pending appeal is vacated.

Costs

Each party shall bear its costs.

AFFIRMED IN PART, REVERSED IN PART, MODIFIED IN PART, AND REMANDED. STAY VACATED.

MAYER, Circuit Judge, concurring in the judgment.

Claim interpretation demands an objective inquiry into how one of ordinary skill in the relevant art at the time of the invention would comprehend the disputed word or phrase in view of the patent claims, specification, and prosecution history. A patent, however, is written for a person of ordinary skill in an art; it is not written for a court. Because it is beyond argument that "[a] judge is not usually a person conversant in the particular technical art involved and is not the hypothetical person skilled in the art to whom a patent is addressed," *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 986, 34 USPQ2d 1321, 1335 (Fed.Cir.1996), a disputed word or phrase in a patent claim, as well as the technology disclosed in the specification and prosecution history, is often far beyond the court's unaided understanding. "Extrinsic evidence, therefore, may be neces-

sary to inform the court about the language in which the patent is written." *Id.*

In this case, infringement hinged on the definition of the word "skinless". The patentee and supporting expert witnesses who were membranologists testified that in light of the specification and prosecution history, one of ordinary skill would understand "skinless" in terms of specific pore size, shape, and resulting way in which fluid flows through the membrane. Micron's experts countered that "skinless" refers to a visible physical characteristic of the membrane that could be viewed with an electron microscope, and requires that a membrane not visually appear to have a skin. Both of these interpretations are plausible and are adequately supported. After a lengthy trial, the district court found in favor of Pall's definition as a matter of underlying fact.

On appeal this panel unanimously agreed on an opinion which held that those findings of fact were not clearly erroneous. Then *Markman* intervened and this case was revisited by direction of the court en banc. Now, without explanation, where it was prepared to sustain the interpretation of "skinless" based on the findings of fact, the court says it is correct as a matter of law. I continue to believe *Markman* was wrongly decided, see 52 F.3d at 989, 34 USPQ2d at 1337, and this case is an example of why. I see no principled basis on which the court may rest its conversion of what once was mutable fact into immutable law. I can sustain the judgment of the district court as not based on clear error. Otherwise there is little for the uninitiated to choose between the contending interpretations. As far as I can see, this court's action is based on mere preference, thus illustrating the artificiality of *Markman*. How it fosters greater predictability and consistency in the law or a certainty that a judge will "arrive at the true and consistent scope of the patent owner's rights", *id.* at 978, 34 USPQ2d at 1329, is beyond my understanding.

Judge Learned Hand put it cogently: "The question was of how the art understood the term, which was plainly a question of fact; and unless the finding was 'clearly erroneous,' we are to take this definition as control-

ling. It is an issue which we are altogether incompetent to decide upon the merits; even the terminology is beyond our acquaintance . . . indeed the very elements themselves are in dispute among those who have made them their life study, as the merest smattering of modern physics quickly discloses to a lay reader. While Congress sees fit to set before us tasks which are so much beyond our powers, suitors must be content that we shall resort to the testimony of experts, though they are concededly advocates with the inevitable bias that advocacy engenders." *Harries v. Air King Prods. Co.*, 183 F.2d 158, 164 (2d Cir.1950).

These cases often deal with the interpretation of complex scientific terms in areas of cutting edge technology. But science is not absolute, it is dynamic; and what is "truth" today is often shown to be error tomorrow. The fact finder may or may not arrive at the "true" meaning of the claims, but that problem is inherent in any judicial undertaking because an undisputed knowledge of fact is largely unobtainable. To suggest that appel-

late judges, precious few of whom are trained in science, will always arrive at the "true" meaning of words embodying complex concepts endows them with knowledge and enlightenment far beyond those who have training and experience in the field. They are in no position to declare the state of knowledge in the art or that scientific hypotheses are correct as a matter of law. Those who provide conflicting testimony and other evidence about scientific or technical matters should be evaluated as are any other expert witnesses and the finder of fact should decide what is the best, most reasonable result in light of the evidence presented. The trial court is the proper forum for such an exercise. This court should review according to traditional standards.

